This package contains a section of the

CE SERVICE HANDBOOK
FOR
79XX SERIES DISC DRIVES

and consists of the following document:

13037 A/B/C/D
DISC CONTROLLER
Part no. 13037-90905

This CE Handbook section also covers the following:

HP 12745 A/D HP-IB Interface Kit
HP 13175 A/B/D Interface Kit
HP 13178 B/C/D Interface Kit

Insert this section into the handbook binder P/N 9282-0683 along with cover and tabset P/N 5957-4228

NOTE

The tabset consists of model numbers for all DMD disc drives to be documented in the CE Service Handbook. Not all of these sections are available at this printing-refer to periodic announcements in the CSD service publication *Support Update* for part numbers and availability.

This handbook is intended as a reference of most-frequently-used material for the trained HP Customer Engineer. The information is condensed from other manuals related to the product and is not intended as a substitute for these manuals (see Related Manuals, page v).

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First Edition . . . . . MAR 1985

NOTICE

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SAFETY CONSIDERATIONS

GENERAL - This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

SAFETY SYMBOLS

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.

Indicates hazardous voltages.

Indicates earth (ground) terminal.

WARNING The WARNING sign denotes a hazard. It calls attention to a procedure or practice which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

SAFETY EARTH GROUND - This is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

BEFORE APPLYING POWER - Verify that the product is configured to match the available main power source according to the input power configuration instructions provided in this manual.

If this product is to be operated with an autotransformer make sure that the common terminal is connected to the earth terminal of the main power source.

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by service-trained personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged after the product has been disconnected from the main power source.

To avoid a fire hazard, fuses with the proper current rating and of the specified type (normal blow, time delay, etc.) must be used for replacement.

To install or remove a fuse, first disconnect the power cord from the device. Then, using a small flat-bladed screw driver, turn the fuseholder cap counterclockwise until the cap releases. Install either end of a properly rated fuse into the cap. Next, insert the fuse and fuseholder cap into the fuseholder by pressing the cap inward and then turning it clockwise until it locks in place.

MAINTENANCE PRECAUTIONS

To avoid injury to personnel and to prevent damage to equipment, observe the following safety precautions:

WARNING

Use extreme caution when working on the HP 13037 Disc Controller with the top removed. Hazardous voltages are present inside the mainframe whenever the ac power cord is connected to an active ac power source. It is essential that all WARNINGS and CAUTIONS stated in the cabinet and other documents be observed.

Observe the warning label when replacing the primary power fuse.

To avoid personal injury, disconnect the power cord from the power source before changing the strapping configuration.

CAUTION

Do not attempt to remove or install the HP12745 Adapter Kit PCA or interconnecting cables without first removing power from all devices.

The HP13037 is wired at the factory for either 120 Vac or 240 Vac (Option 015) input voltage. A reversible label on the rear panel denotes the wiring configuration. The 120 Vac configuration can be changed to 100 Vac operation and the 240 Vac configuration can be changed to 220 Vac by changing the strapping on the transformer barrier block. ***No other wiring configurations are permissible.***

RELATED MANUALS

07906-90901	7906A/B User's Manual
07906-90902	7906A/B Installation Manual
07906-90903	7906A/B Service Manual
07906-90905	7906A/B/C CE Handbook
07906-90911	7906D User's Manual
07906-90912	7906D Installation Manual
07906-90913	7906D Service Manual
07920-90001	7920A Operating and Service Manual
07920-90030	7920 A/B Operator's Manual
07920-90901	7920 A/B Installation Manual
07920-90902	7920B Service Manual
07920-90911	7920D User's Manual
07920-90912	7920D Installation Manual
07920-90913	7920D Service Manual
07925-90901	7925 A/B User's Manual
07925-90902	7925 A/B Installation Manual
07925-90903	7925 A/B Service Manual
07920-90905	7920/7925A/B/D CE Handbook
07925-90911	7925D User's Manual
07925-90912	7925D Installation Manual
07925-90913	7925D Service Manual
12904-90003	Installation Instructions for 12904A, -001 Slide Mounting Kit
12745-90901	12745A Disc Controller to HP-IB Adapter Kit Installation and Service
12745-90911	12745D Disc Controller to HP-IB Adapter Kit Installation and Service
13037-90006	13037 A/B/C Installation and Service Manual
13037-90015	13175A/B/13178B/C Interface Kits Installation and Service

RELATED MANUALS

13037-90905	13037 A/B/C/D CE Handbook Section
13037-90911	13037D Installation and Service Manual
13037-90921	13175D/13178D Interface Kits Installation and Service Manual
13365-90901	13365A Programming Manual
19510-90911	Installation Instructions for HP 19510D Slide Mounting Kit
29425-90001	29425A/B Installation and Service Manual
29425-90911	29425D Installation and Service manual
40019-90901	40019A/B Installation and Service manual
40019-90911	40019D Installation and Service Manual

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PRODUCT INFORMATION

SECTION I

1-1. PRODUCT DESCRIPTION

The HP 13037 Disc Controller is a microprocessor-controlled device capable of connecting any HP 7906/HP 7920/HP 7925 Disc Drive to any HP computer interface. It will accommodate any combination of HP 7906, HP 7920 and HP 7925 Disc Drives and one through eight computer interfaces. Refer to table 1-1 for product descriptions. Figure 1-1 shows a block diagram of the HP 13037. descriptions.

The HP 12745 HP-IB Adapter provides the interface necessary to allow communication between an HP 13037 and HP-IB hosts. The HP 13037 Option 050 provides a means for interfacing the HP 13037 with up to three HP-IB host computers.

The HP 13175 Interface Kit provides the means to interface the HP 13037 with one HP 1000 series computer. The HP 13178 Interface Kit provides the means to interface from two to eight HP 1000 series computers with the HP 13037.

Note: The maximum HP 1000's that can be interfaced to an HP 13037A is two. Up to eight HP 1000's can be interfaced to a single HP 13037B/C/D model.

1-2. OPTIONS AND ACCESSORIES

Refer to table 1-2.

Table 1-1. Product Description

Model	Option	Description
HP 13037A		Original Disc Controller. Used with HP 7905.
HP 13037B		Occurred at obsolescence of HP 7905; start of support for HP 7906/7920/7925 Extended interface capabilities to eight CPU's.
HP 13037C		Redesigned power supply to meet European regulations in 1979.
HP 13037D		Added shielding for U.S.A. RFI requirements -- 1983.
HP 13037U		Add on HP 13037 to upgrade HP 7906/HP 7920/HP 7925 "S" Model Disc Drives to "M" models.
	015	240V/50 Hz operation
	025	Substitutes rack mount rails Kit for mounting HP 13037 in HP 29431F Cabinet.
	050	HP-IB Extender. Supplies separate chassis to accommodate up to three HP-IB Adapter Kits.
	102	Adds HP 12745 HP-IB Adapter Kit. supplied with 2 m (6.5 ft) HP-IB Cable.
HP 13037R		HP 13037 Rack Mount Kit
	025	Substitutes rails for HP 29431F cabinet.

Table 1-2. Options and Accessories

Product	Option	Description
13013D		Multiunit Cable (refer to table 3-2 for lengths).
13213D		Data Cable (refer to table 3-2 for lengths).
13175D		HP 1000 Single Computer Interface Kit (refer to table 3-2 for optional cable lengths).
13178D		HP 1000 Multi-computer Interface Kit (refer to table 3-2 for optional cable lengths).
12745D		Disc Controller to HP-IB Adapter Kit.

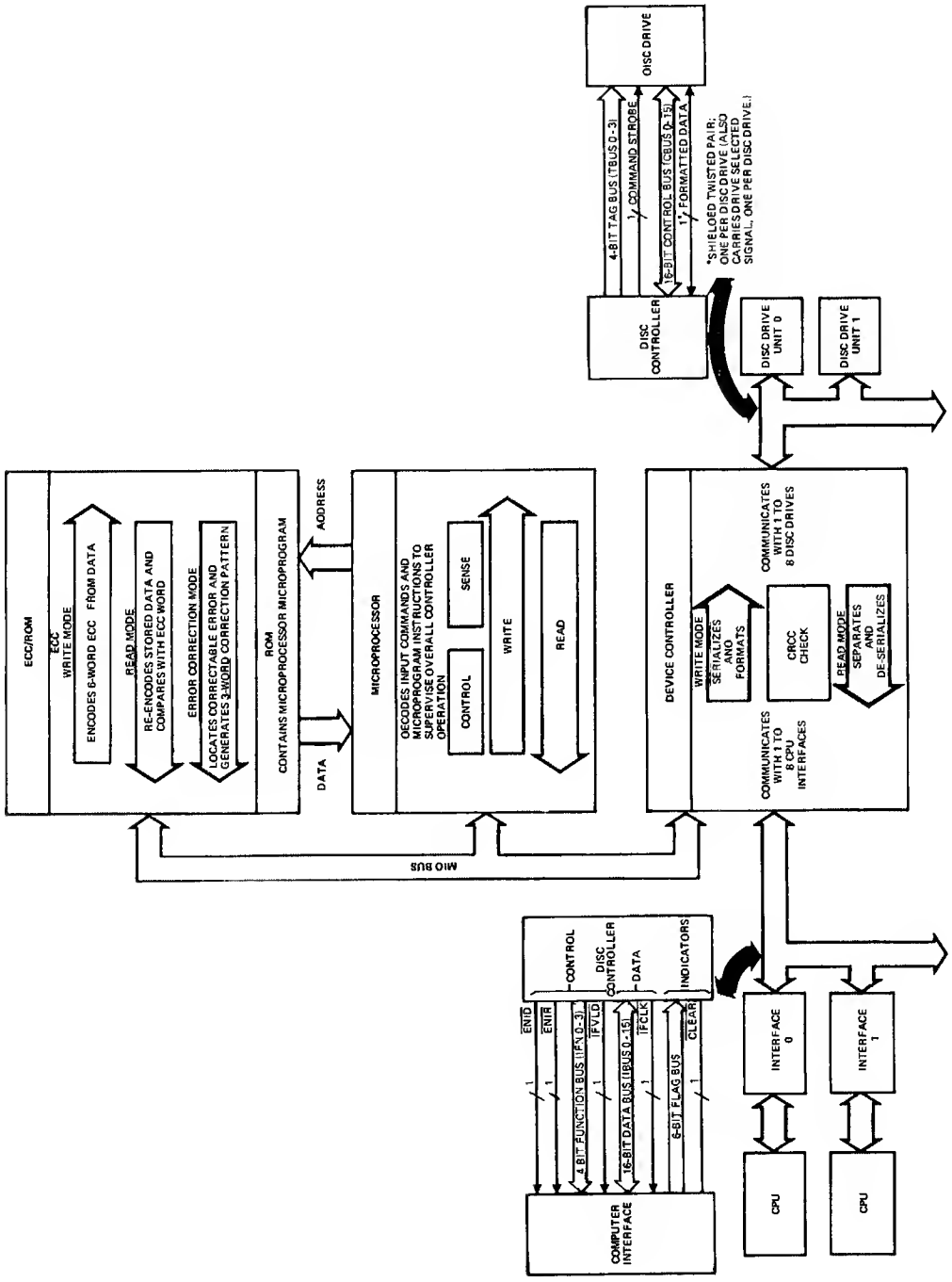


Figure 1-1. HP 13037 Functional Block Diagram

ENVIRONMENTAL/INSTALLATION/PM

SECTION II

2-1. ENVIRONMENTAL REQUIREMENTS

All HP 13037 models meet the environmental requirements of the host system. Table 2-1 lists the environmental limitations. Table 2-2 lists the physical characteristics for reference.

Table 2-1. HP 13037 Environmental Limitations

```
AMBIENT TEMPERATURE
 Operating: . . . . . 0° to 55°C (32° to 131°F)
 Nonoperating: . . . . . -40° to 75°C (-40° to 167°F)

ALTITUDE
 Operating: . . . . . 4 572 metres (15,000 feet) max
 Nonoperating: . . . . . 15 300 metres (50,000 feet) max

RELATIVE HUMIDITY
 0 to 95% at 25° to 40°C (77° to 104°F)
 without condensation

SHOCK
 Operating: . . . . . 0.5 g rms random
 Nonoperating: . . . . . 1 g rms random

POWER
 Single phase 100, 200, 220, 240 Vac +5, -10%,
 frequency range 47.5 to 66 Hz

POWER CONSUMPTION (Typical)
 230 watts/2.3 at 120V, 60 Hz
```

2-2. RACKMOUNTING KITS

For standard EIA 483 mm (19 inch) cabinets, use P/N 13037-60012 to mount the HP 13037A. For the HP 29431F Cabinet, use HP 13037R Rack Mount Kit.

2-3. PHYSICAL CHARACTERISTICS

Table 2-2. HP 13037 Physical Characteristics

```
DIMENSIONS
  Height: . . . . . 13.3 cm (5.25 in.)
  Width: . . . . . 48.0 cm (18.90 in.)
  Depth: . . . . . 54.6 cm (21.50 in.)

WEIGHT (Approximate)
  HP 13037: . . . . . Net: 17.1 kg (39 lbs)
                      Shipping: 28.1 kg (62 lbs)
  HP 13037 Opt 050: . . . . . Net: 18.9 kg (42 lbs)
```

2-4. HP 12745 INSTALLATION

A. Interface PCA Installation -- Each PCA draws 3A at 5V.

B. Bus Termination -- Verify correct termination in place as shown in figure 2-1. In a multi-CPU configuration (HP 13037 Opt 050) only the lowermost PCA can have terminations in place.

C. PCA Installation -- See figure 2-3.

Note: Only HP 13037B models with number serial prefix 1740 or later or HP 13037C and HP 13037D models will accept direct HP 12745 installations. For HP 13037B's with a serial prefix prior to 1740 refer to Service Note 13037B-01.

D. Cable Connection -- See figure 3-1.

E. Controls and Indicators -- See figure 2-4.

2-5. HP 13175/13178 INTERFACE KIT INSTALLATION

A. Interface Address Jumpers -- See figure 2-2 for interface address jumper setting.

B. Preset Jumper -- See figure 2-2 for W4 PR Enable/Disable position.

C. Interface PCA Installation -- Each PCA draws 2A at 5 Vdc and 100 mA at -2 Vdc. Verify current requirements.

D. Cabling -- See figure 3-7 for single computer cabling. See figure 3-8 for two computer cabling. See figure 3-9 for three to eight computer cabling.

2-6. HP 13037D INSTALLATION

Note: For the HP 13037A/B refer to *HP 13037 Disc Controller Installation and Service Manual*, P/N 13037-90006.

A. AC Power Source Check -- Verify incoming power (refer to table 2-1).

B. AC Power Cord Check -- Verify correct power cord (see figure 9-1).

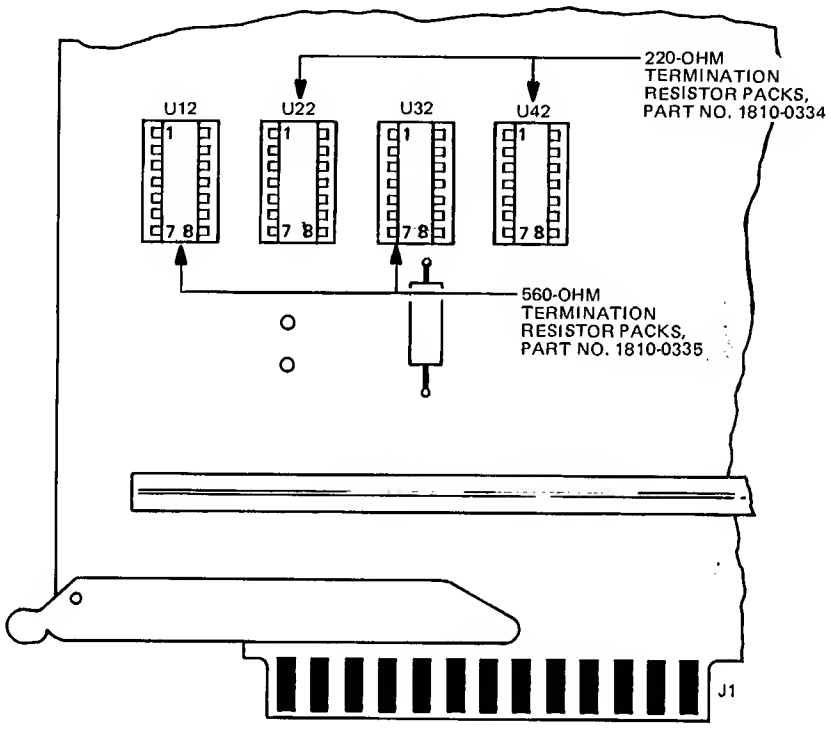
C. Fuse Rating Check -- Verify correct primary fuses (refer to table 2-3).

D. Primary Winding -- Verify correct transformer strapping configuration (see figure 2-5).

E. Power Supply Check -- Verify correct power supply voltages. See figure 2-6 for test points. Refer to tables 2-4 and 2-5 for measured values.

F. Cable Interconnections -- See figure 3-1 to verify the controller interconnections to the disc drives.

G. External Cabling -- See figures 3-5 through 3-13 for interconnections between the HP 13037, host CPU's and disc drives. Refer to table 3-2 for various interconnect cable lengths.

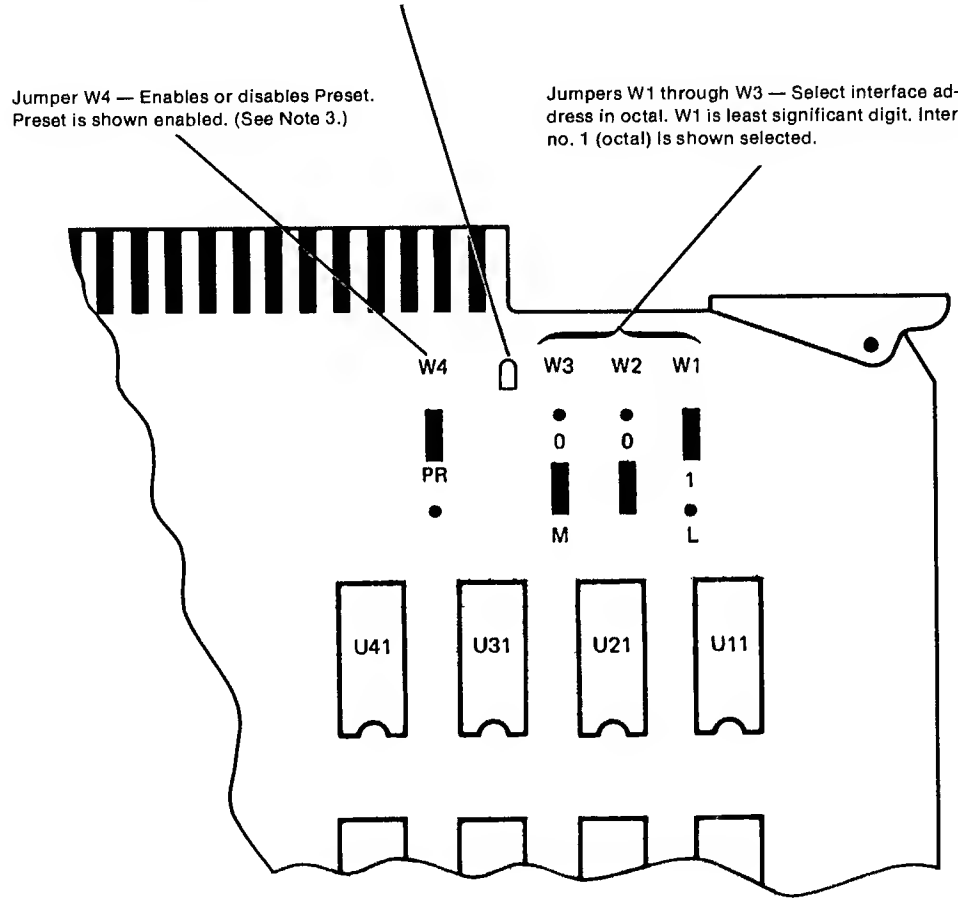


NOTES: 1. IN A SINGLE-CPU DISC DRIVE SYSTEM, THE FOLLOWING TERMINATION RESISTOR PACKS MUST BE INSTALLED IN SOCKETS U12, U22, U32, AND U42. ENSURE THAT THE PIN NUMBERS ARE ORIENTED AS SHOWN ABOVE.

SOCKET	RESISTOR PACK	HP PART NO.
U12	560 Ω	1810-0335
U22	220 Ω	1B10-0334
U32	560 Ω	1810-0335
U42	220 Ω	1810-0334

2. IN MULTI-CPU DISC DRIVE SYSTEMS, THE FOUR TERMINATION RESISTOR PACKS MUST BE REMOVED FROM SOCKETS U12, U22, U32, AND U42, OF ALL BUT THE LOWER-MOST PCA.

Figure 2-1. HP 12745 Bus Terminations

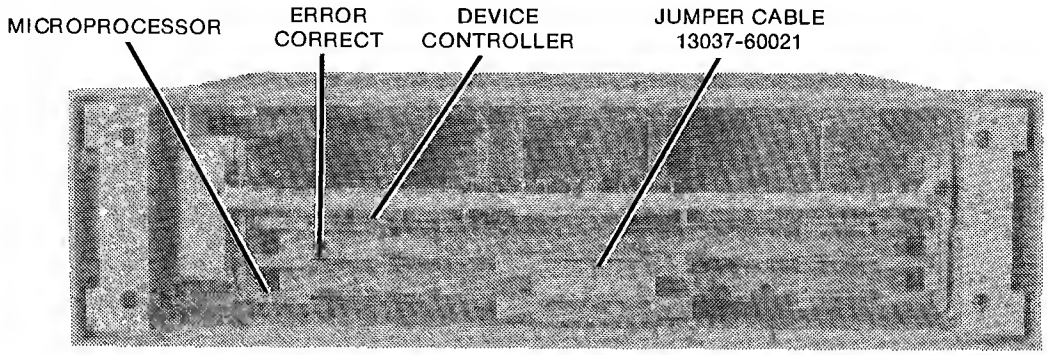


NOTES:
1. Jumpers W1 through W4 and SEL LED are identical on Interface PCA, part no. 13037-60023 and Add-On Interface PCA, part no. 13037-60025.
2. Jumpers W1 through W4 and SEL LED are not labeled on above PCA's.
3. It is recommended that in a multiple computer system, one interface (designated as the master) have preset enabled while all other interfaces have the preset function disabled.

Figure 2-2. Interface PCA Jumper Locations

2-7. HP 13037 PCA LOCATION/CONFIGURATION

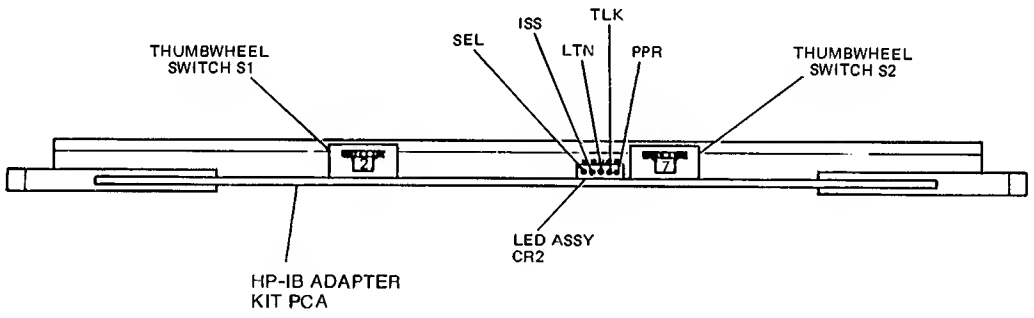
See figure 2-3 and figures 3-5 through 3-13 for PCA locations. For PCA functions refer to paragraph 4-2.



NOTE: THE MICROPROCESSOR AND ERROR CORRECT PCA'S MAY BE INSTALLED IN EITHER OF THE TWO LOWER CARD SLOTS, BUT MUST BE CONNECTED TOGETHER AT THE CENTER CONNECTORS WITH JUMPER CABLE 13037-60021.

Figure 2-3. Controller PCA Configuration

2-8. HP 12745 PCA CONTROLS AND INDICATORS



CONTROL/ INDICATOR	FUNCTION
SWITCH S1	Selects CPU number (0 – 7). Number is detected by controller during its polling operation. In a multi-CPU system, no two CPU's can have the same number.
SWITCH S2	Selects HP-IB address (0 – 7).
LED ASSY CR2	Indicates operational state of adapter kit PCA. LED's are coded as follows:
	SEL — SELECT. When LED is lit, it indicates that controller is operating on adapter kit PCA. When controller is idle, LED will be dimly lit.
	ISS — IDENTIFY STANDBY STATE.
	LTN — LISTEN. When LED is lit, it indicates that adapter kit PCA is in Listen mode.
	TLK — TALK. When LED is lit, it indicates that adapter kit PCA is in Talk mode.
	PPR — PARALLEL POLL RESPONSE. When LED is lit, it indicates that adapter kit PCA is ready to respond to a Parallel Poll from the controller of the HP-IB as soon as it is given.

Figure 2-4. Adapter Kit PCA (12745-60010) Controls and Indicators

2-9. AC POWER CORDS/FUSES/STRAPPING

2-10. POWER CORD OPTIONS

See figure 9-1 for available power cords.

2-11. RESTRAPPING

See figure 2-5 for restrapping input power.

2-12. FUSES

Refer to table 2-3 for fuse part numbers.

Table 2-3. Primary Power Fuse Rating

SOURCE	RATING	HP PART NO.
100 Vac	4A, 250V, SB	2110-0365
120 Vac	4A, 250V, SB	2110-0365
220 Vac	2A, 250V, SB	2110-0303
240 Vac	2A, 250V, SB	2110-0303

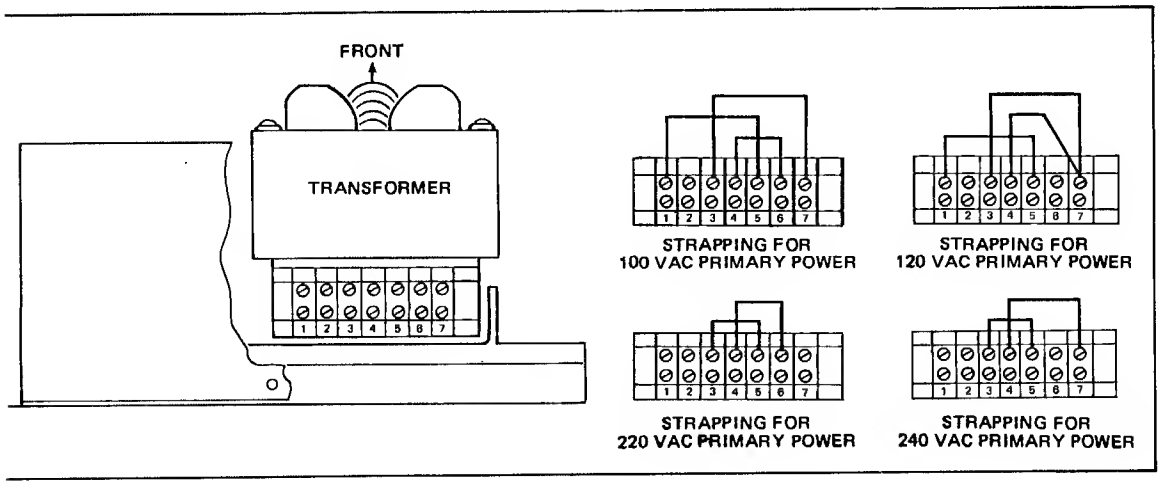


Figure 2-5. Transformer Strapping Configurations

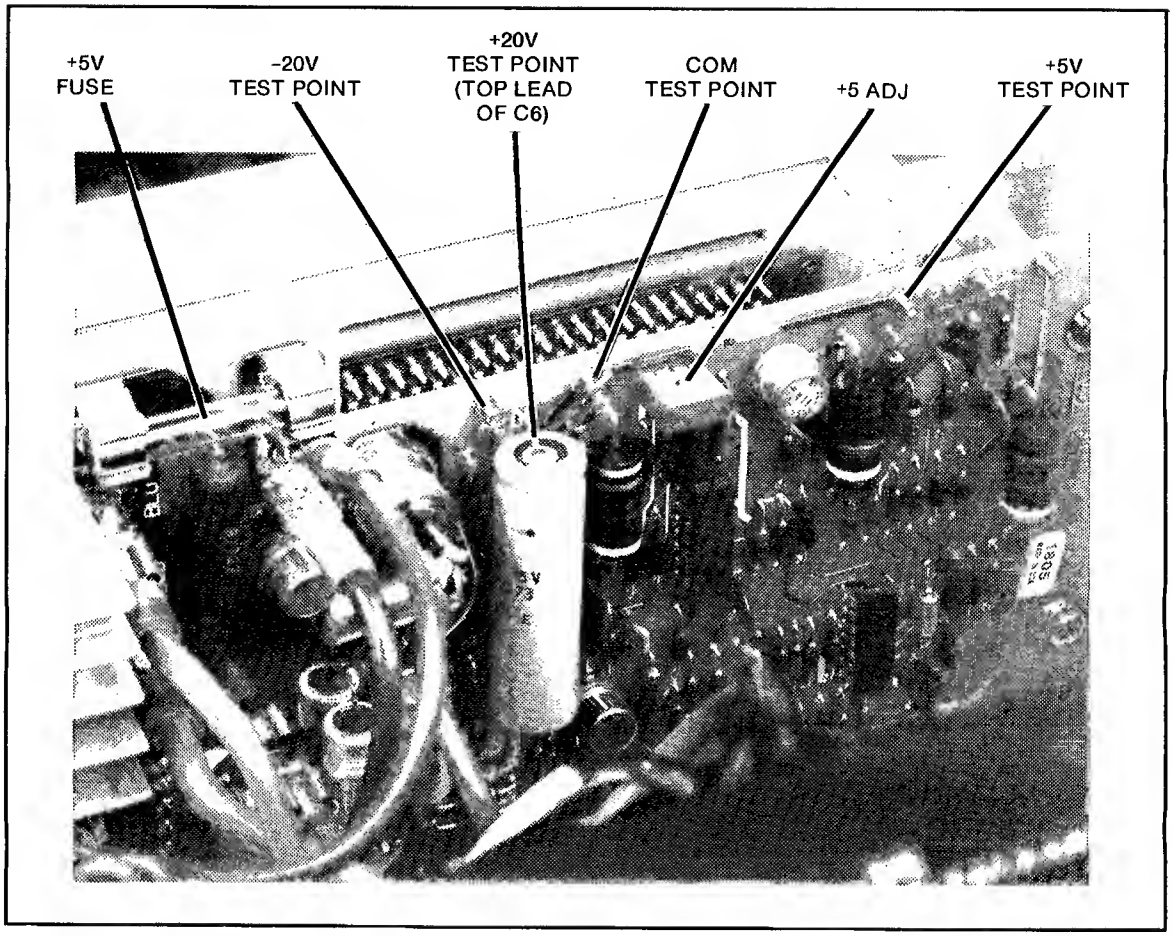


Figure 2-6. Power Supply Adjustment and Test Points

2-13. PREVENTIVE MAINTENANCE

Perform PM semi-annually.

A. Clean Product -- Remove dust and dirt

B. Check Voltage -- Measure voltages (refer to tables 2-4 and 2-5).

C. Check Fans -- Verify fans start when power is applied. When power is removed the fan spin-down time should be => than 13 seconds.

Table 2-4. HP 13037D Power Supply Voltages

SUPPLY	SPECIFICATIONS
+5V Regulated	Voltage: +4.95 to +5.05 Vdc (adjustable) Ripple and Noise: < 1 mV rms
-5V Regulated	Voltge: -4.75 to -5.25 Vdc (nonadjustable) Ripple and Noise: < 5 mV rms
+20V Unregulated	Voltage: +18 Vdc nominal (nonadjustable) Ripple: ≤ 3.1V p-p @ maximum load
-20V Unregulated	Voltage: -18 Vdc nominal (nonadjustable) Ripple: ≤ 3.1V p-p @ maximum load

Table 2-5. HP 13037 +5V Supply Limits*

POWER REG	POWER BACKPLANE	SERIAL PREFIX NO.	VOLTAGE SETTING
13037-6X018	and 13037-60020	Up to 1730	5.1 - 5.36
13037-6X018	and 13037-60027	Repaired Controller	5.1 - 5.36
13037-6X026	and 13037-60020	1730	5.1 - 5.36
13037-6X026	and 13037-60027	1735 to Present	4.95 - 5.05

X = 0 New
9 Exchange Use the above table for any repaired or updated controllers.

* *See Service Notes 13037A-11, 13037B-06 and 13037-06.*

CONFIGURATION

SECTION III

3-1. SYSTEM CONFIGURATION

Figure 3-1 through 3-13 provide the various configuration details for the HP 13037, HP 12745, HP 13175 and HP 13178. For Information on what MAC family disc drives are supported in various systems refer to the *Peripheral Configuration Guide p/n 5953-9450*, available from Corporate Liturature Distribution Center, COMSYS 0070.

3-2. FIRST SERIAL NUMBERS

The first serial number prefix for each model is listed below.

DRIVE	A	B	C	D
7905	1429A	none	none	none
7906	1808A	1915A	none	2332A
7920	1652A	1916A	none	2332A
7925	1820A	1916A	none	2332A
13037	1509A	1630A	1915A	2332A

3-3. PCA COMPATABILITY

Table 3-1 list the minimum date code requirements required to support various CPUs.

Table 3-1. HP 13037 Date Codes

PCA DESCRIPTION	PART NUMBER NOTE 1	SINGLE CPU'S MX	SINGLE CPU'S XE	2 CPU'S MX	2 CPU'S XE	3-8 CPU'S MX	3-8 CPU'S XE	3000 SYSTEM	Date Codes OF BOARDS (NOTE 6)
Interface	13037-60003	1628	no NOTE 2	1628 NOTE 3	no	no	no	n/a	no
Interface Add-on	13037-60013	1628	no	1628 NOTE 3	no	no	no	n/a	no
Interface	13037-60023	1635	1635	1635	1635	1635	1635	n/a	1635
Interface Add-on	13037-60025	1635	1635	1635	1635	1635	1635	n/a	1635
Micro Processor	13037-60001	1530	1530	1530	1530	1530	1530	1530	1530
Device Controller	13037-60002 NOTE 7	1535	1535	1535	1535	1535	1630 NOTE 4	1630	1630
Error Correct	13037-60004 NOTE 8	1540 NOTE 5	1540 NOTE 5	1540	1540	no	no	no	no
Error Correct	13037-60024	1625	1625	1625	1625	1625	1625	1650	1650

Notes:

1. Exchange program replacement PCA's will have 13037-6(9)0xx part numbers instead of new PCA 13037-6(0)0xx numbers.

2. "NO" indicates that the PCA is not compatible with that particular processor for the prescribed configuration.

3. If noise immunity problems are encountered due to unusually noisy environments, a change to -60023/25 -1635 may help.

4. If customer frequently utilizes Auto Restart in RTE, -1630 is recommended.

5. In disc I/O bound 2 CPU applications, a change to 13037-60024 date code -1625 may improve performance.

6. Shipped exchange boards will be of these date codes or greater.

7. 13037-60002 Device Controller boards cannot be used in 7925 applications without experiencing increased error rates; use 13037-60028 Device Controller boards in these applications.

8. This board cannot be used in applications involving 7906, 7920, or 7925 disc drives, unless ROM Retrofit Kit 12733A is used to upgrade the board to 13037-60024 date code -1625.

Table 3-2. Cable Options

MULTI UNIT CABLES - 13013B/D

LENGTH*	13013B	OPTION	13013D
6	13013-60011	001	13013-60024
8	13013-60012	003	13013-60025
12	13013-60013	STD	13013-60027
18	13013-60014	002	13013-60028
40**	13013-60017	H01	13013-60031
50**	13013-60018	H02	13013-60032
25**	13013-60019	H03	13013-60029
30**	13013-60020	H04	13013-60030
9**	13013-60021	H05	13013-60026
60**	13013-60022	H09	13013-60033
70**	13013-60023	H10	13013-60034

MULTI CPU CABLE & PCA - 13178C/D

LENGTH*	13178C	OPTION	13178D
8	13178-60003	STD	13178-60007
16	13178-60004	001	13178-60008
50**	13178-60005	H04	13178-60010
25**	13178-60006	H05	13178-60009

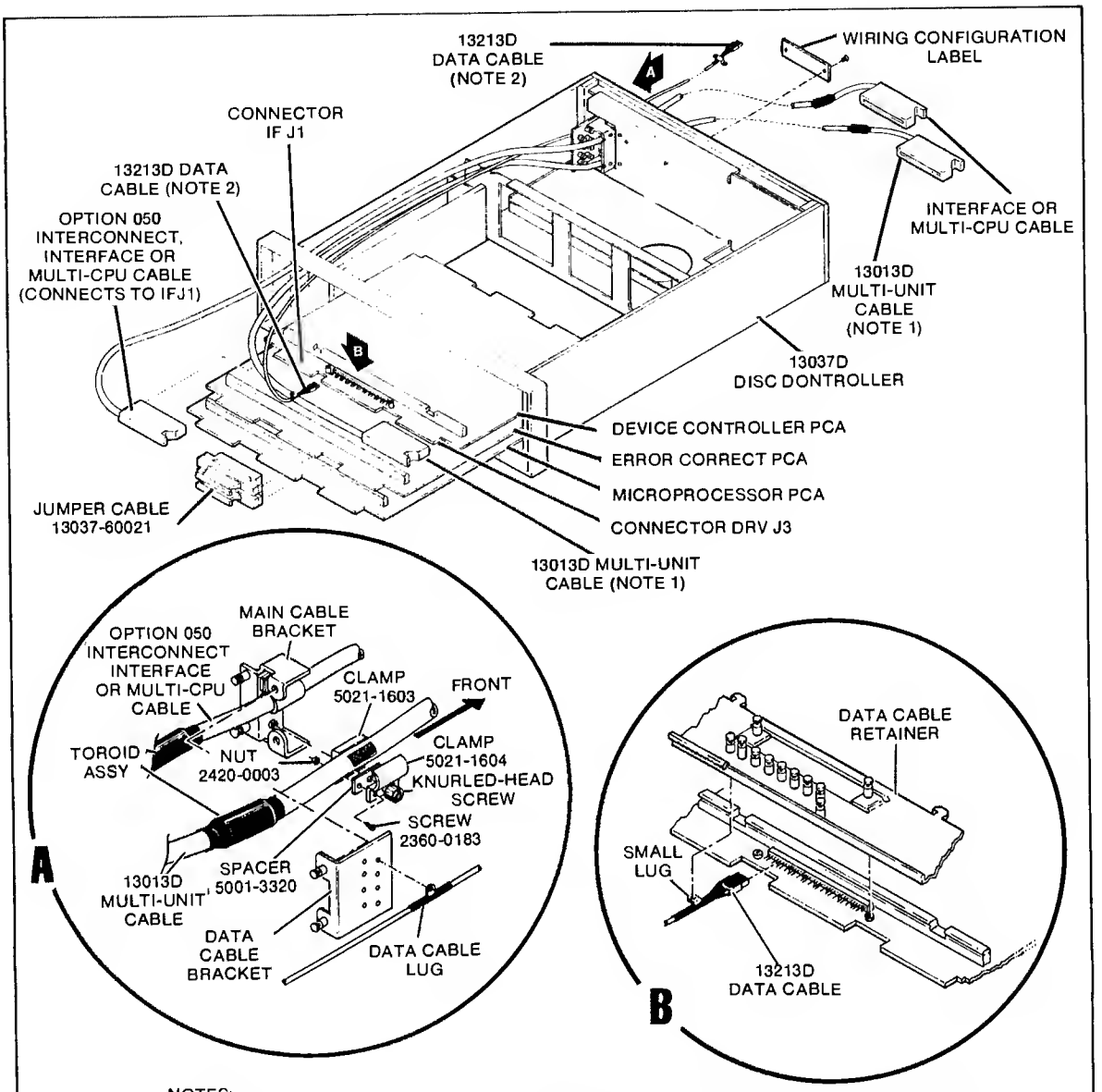
INTERFACE CABLE & PCA - 13175B/D

LENGTH*	13175B	OPTION	13175D
18	13037-60030	STD	13037-60043
30**	13037-60037	H02	13037-60044
50**	13037-60036	H05	13037-60045
65**	13037-60039	H08	13037-60046
6	13037-60029	025	13037-60047

DATA CABLES - 13213B/D

LENGTH*	13213B	OPTION	13213D
6	13213-60006	004	13213-60011
10	13213-60007	STD	13213-60012
25	13213-60008	001	13213-60013
50	13213-60009	002	13213-60014
75	13213-60010	003	13213-60015

*In feet
**All D model cables can be ordered from CPC. Replace all older model cables with D model cables



NOTES:

1. THE HP 13013D MULTI-UNIT CABLE IS AVAILABLE IN FOUR LENGTHS AS FOLLOWS. MAXIMUM CUMULATIVE CABLE LENGTH, CONTROLLER TO LAST DISC DRIVE, IS 25.55 M (74 FT).

CABLE	PART NO.	LENGTH
13013D-001	13013-60024	1.83 M (6 FT)
13013D-003	13013-60025	2.44 M (8 FT)
13013D	13013-60027	3.66 M (12 FT)
13013D-002	13013-60028	5.49 M (18 FT)

2. THE HP 13213D DATA CABLE IS AVAILABLE IN FIVE LENGTHS AS FOLLOWS:

CABLE	PART NO.	LENGTH
13213D-004	13213-60011	1.83 M (6 FT)
13213D	13213-60012	3.05 M (10 FT)
13213D-001	13213-60013	7.62 M (25 FT)
13213D-002	13213-60014	15.24 M (50 FT)
13213D-003	13213-60015	22.86 M (75 FT)

Figure 3-1. Controller Interconnection Diagram

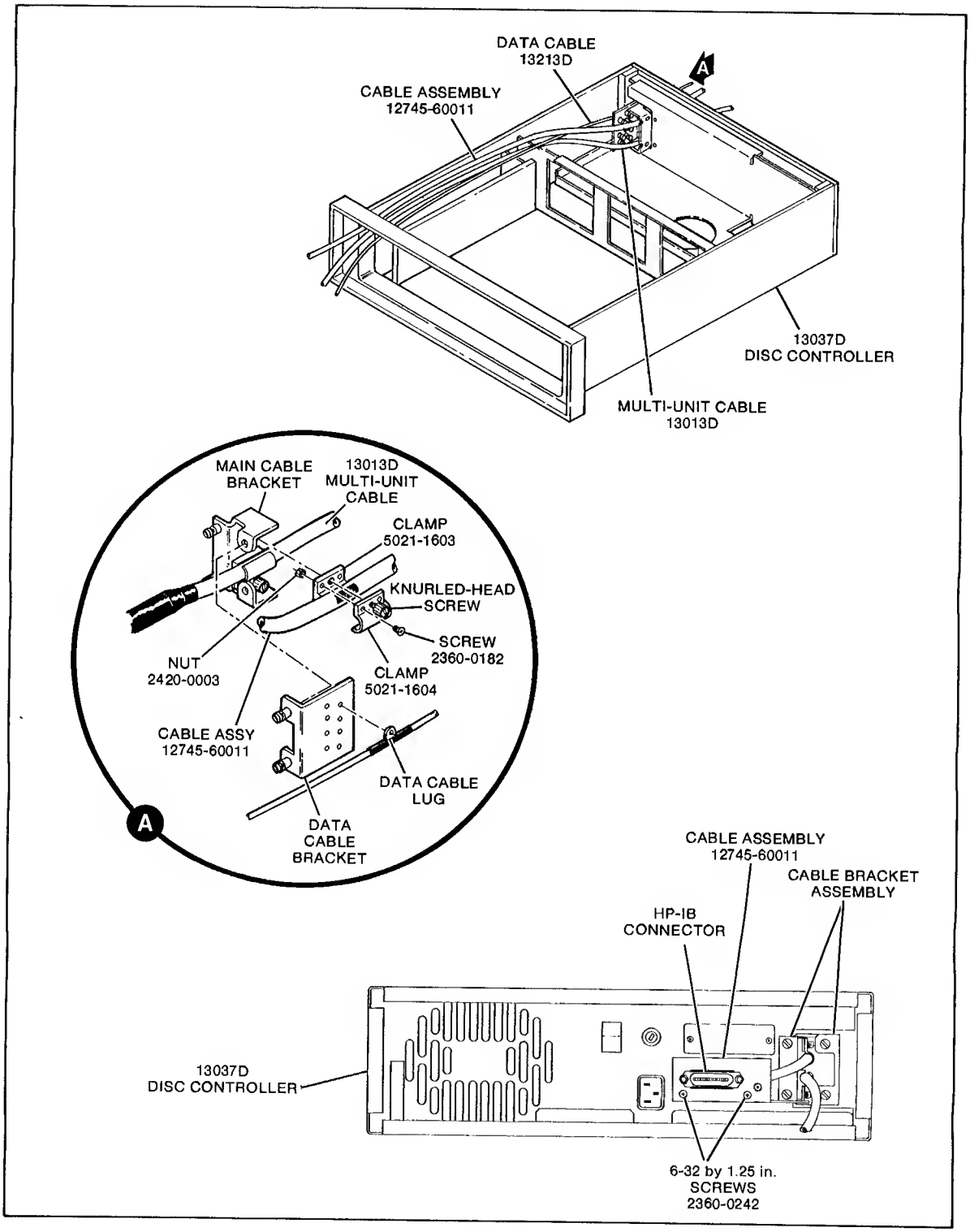


Figure 3-2. HP 12745D Installation in HP 13037D

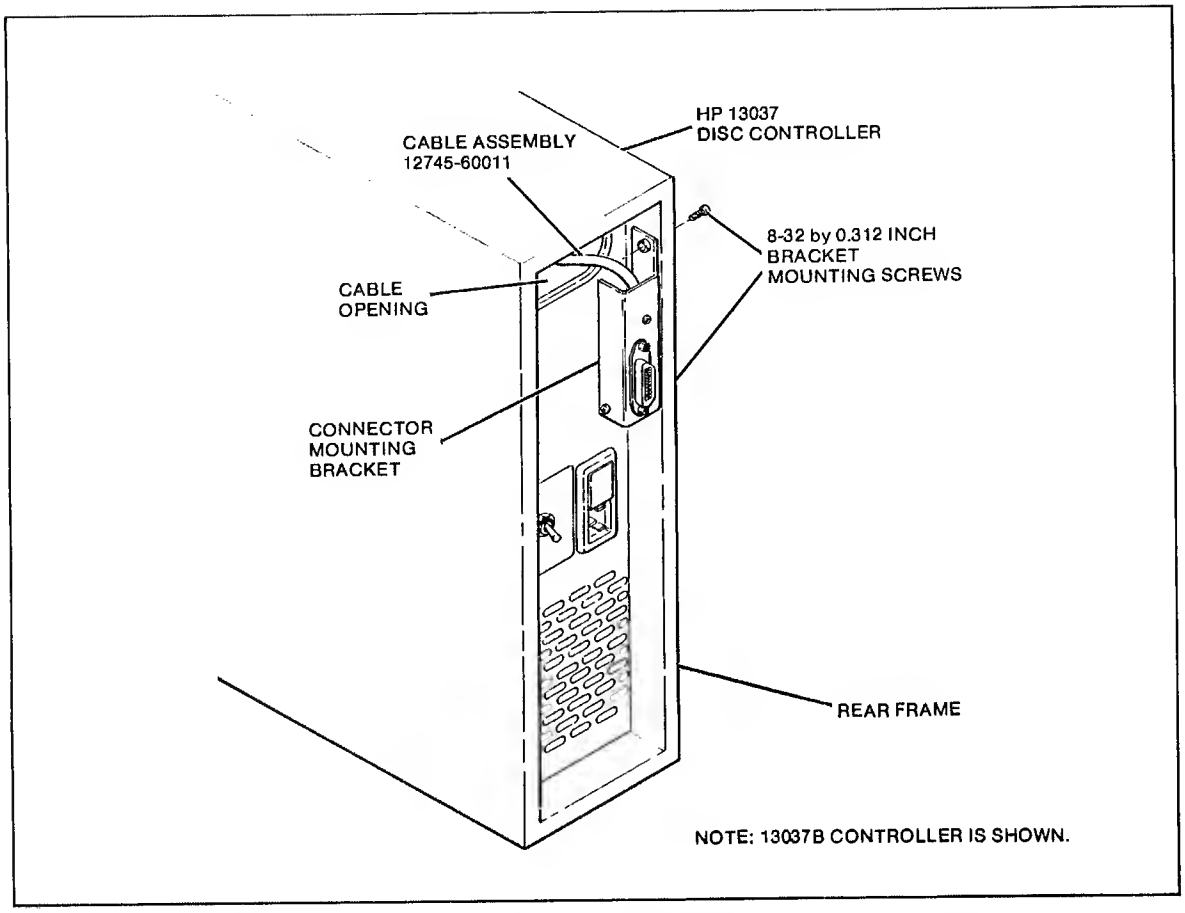


Figure 3-3. HP 12745A Installation in HP 13037B/C

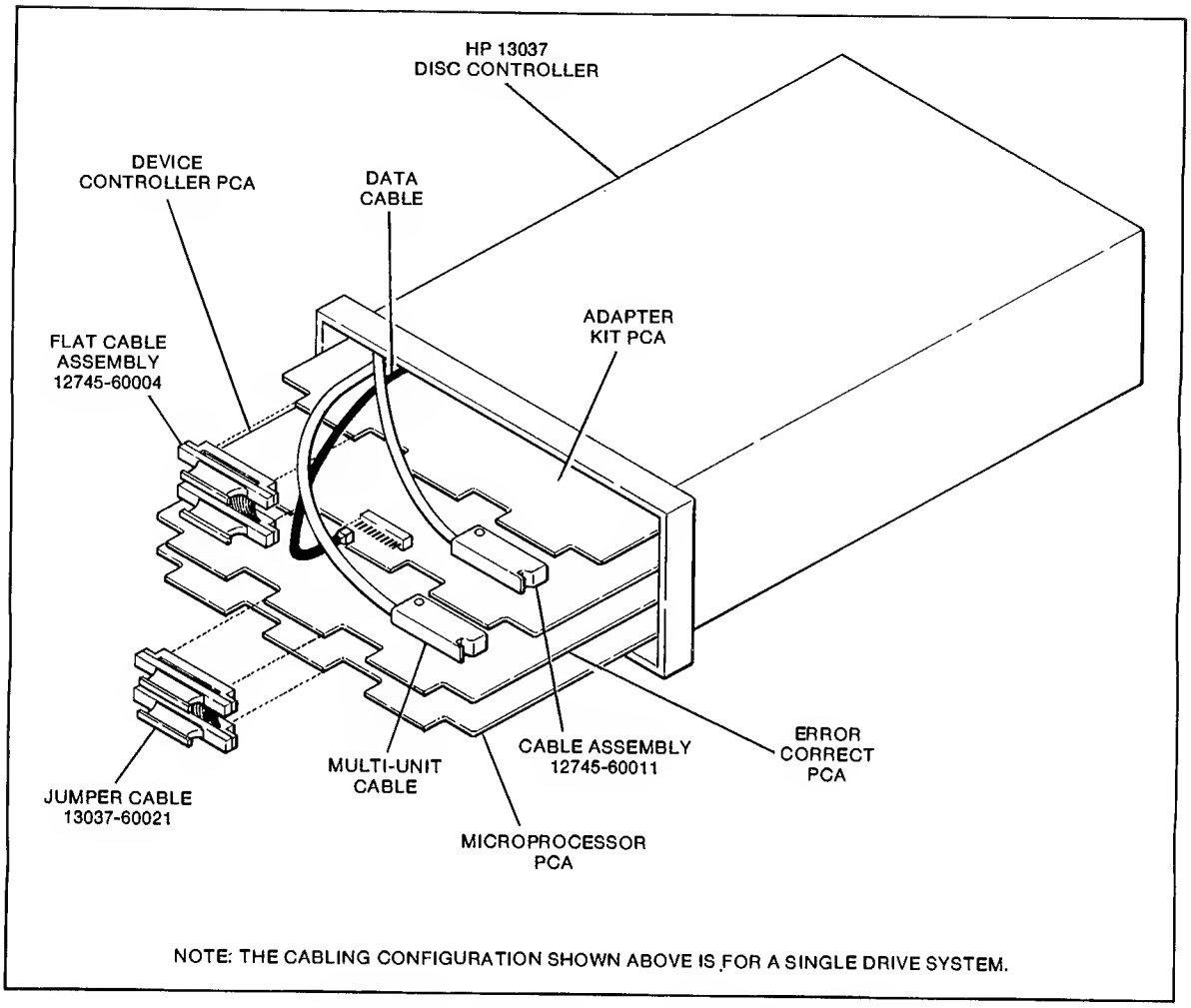


Figure 3-4. HP 12745D Installation Details, Single Drive System

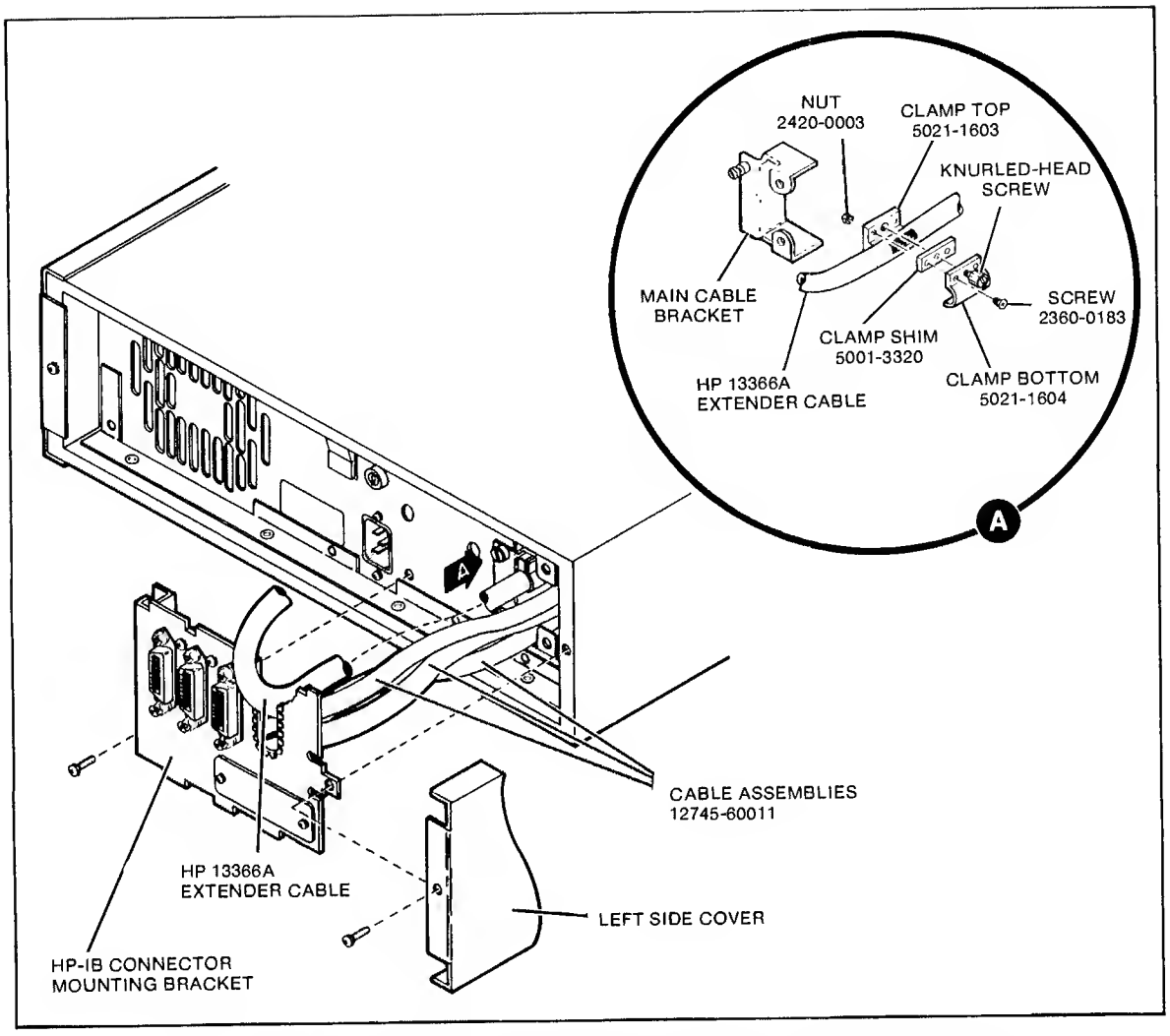


Figure 3-5. HP-IB Opt. 050 Bracket and Cable Installation

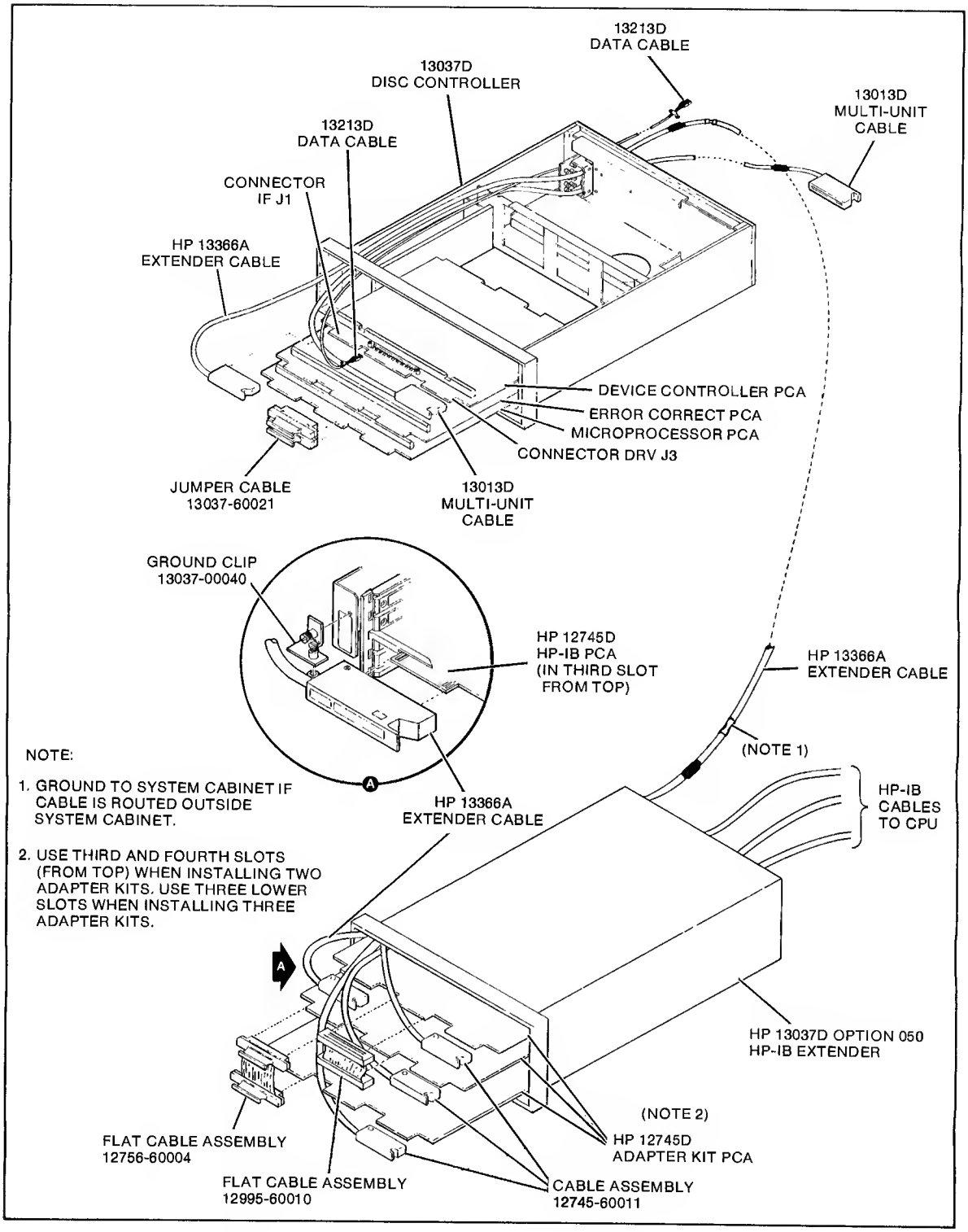
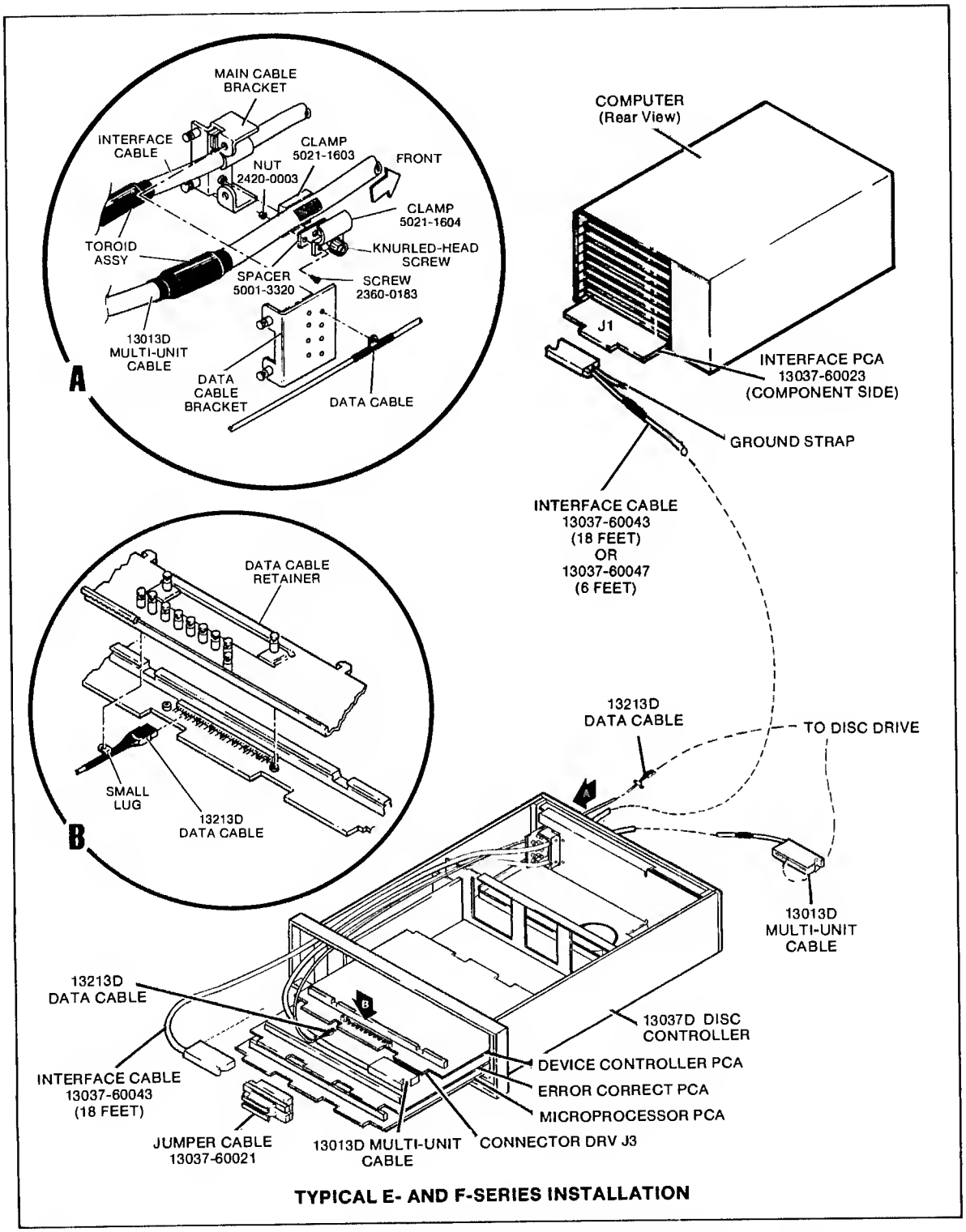
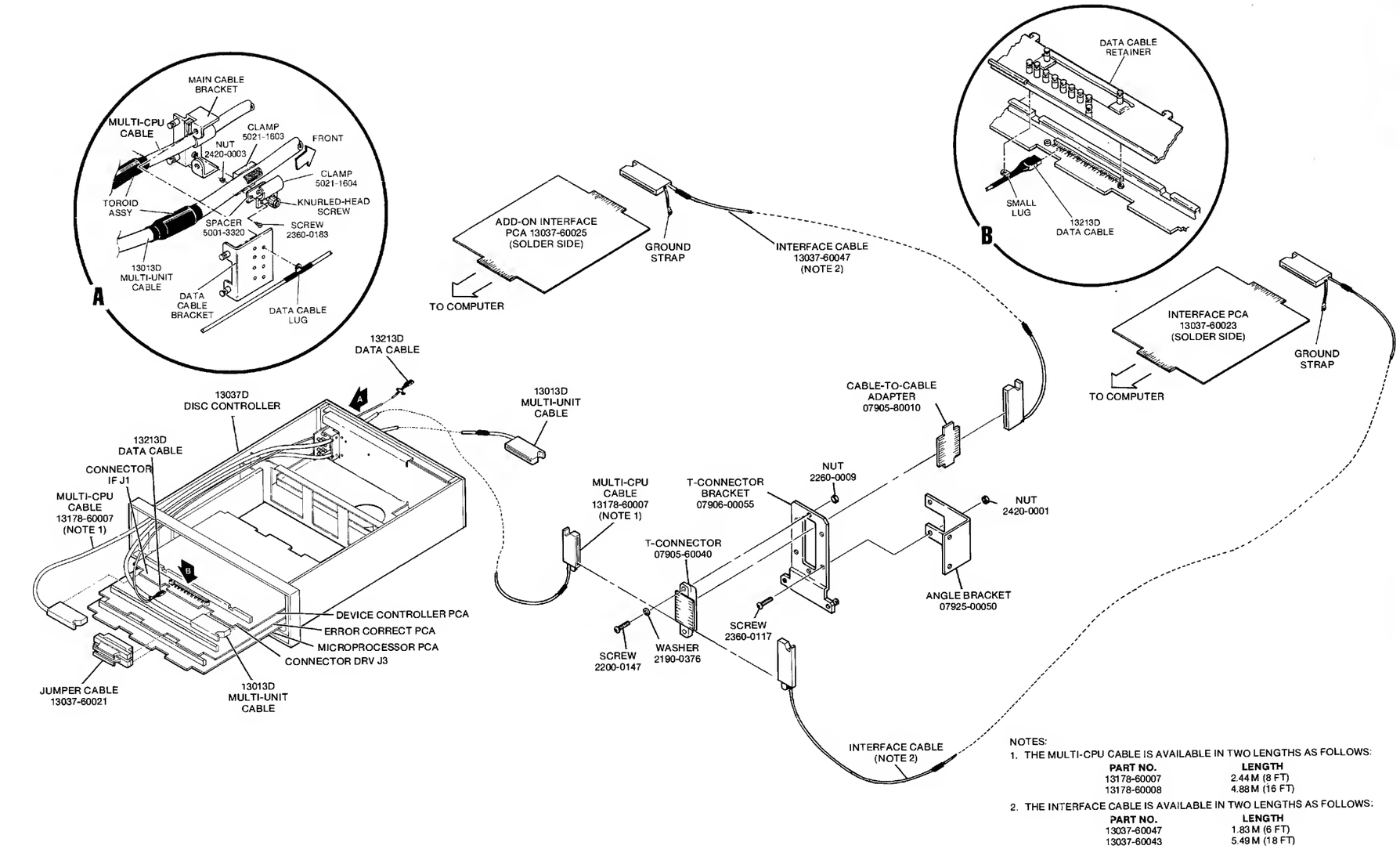


Figure 3-6. HP 13037D Opt. 050 Cabling Diagram



7305-11

Figure 3-7. D Model Single CPU Configuration Cabling Diagram



NOTES:

1. THE MULTI-CPU CABLE IS AVAILABLE IN TWO LENGTHS AS FOLLOWS:

PART NO.	LENGTH
13178-60007	2.44 M (8 FT)
13178-60008	4.88 M (16 FT)

2. THE INTERFACE CABLE IS AVAILABLE IN TWO LENGTHS AS FOLLOWS:

PART NO.	LENGTH
13037-60047	1.83 M (6 FT)
13037-60043	5.49 M (18 FT)

7305-9B

Figure 3-8. D Model Two CPU Configuration Cabling Diagram

NOTES:

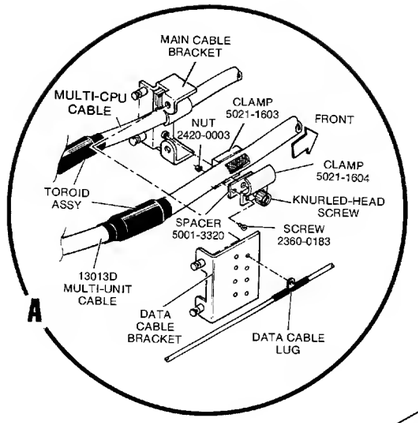
1. THE MULTI-CPU CABLE IS AVAILABLE IN TWO LENGTHS AS FOLLOWS:

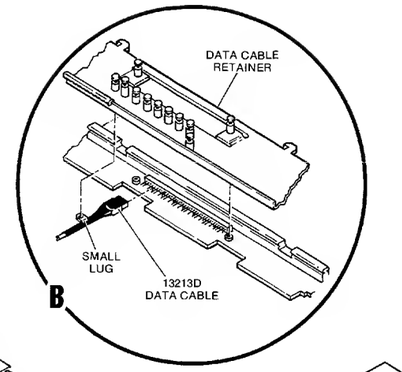
PART NO.	LENGTH
13178-60007	2.44 M (8 FT)
13178-60008	4.88 M (16 FT)

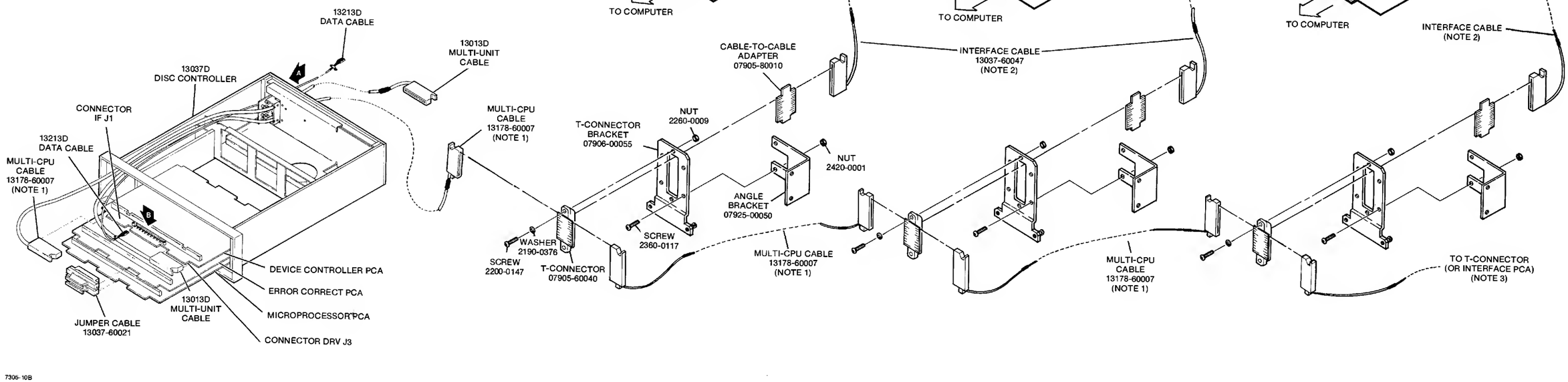
2. THE INTERFACE CABLE IS AVAILABLE IN TWO LENGTHS AS FOLLOWS:

PART NO.	LENGTH
13037-60047	1.83 M (6 FT)
13037-60043	5.49 M (18 FT)

3. CABLING IS SHOWN FOR A THREE-INTERFACE SYSTEM. FOR ADDITIONAL INTERFACES, CONNECT THE 13178-60007 MULTI-CPU CABLE TO THE 07905-60040 T-CONNECTOR AND EXTEND SYSTEM AS SHOWN. THE LAST PCA IN THE CHAIN MUST BE THE INTERFACE PCA, PART NO. 13037-60023. THE OVERALL LENGTH OF THE CHAIN SHOULD NOT EXCEED 22.6 METRES (74 FEET).

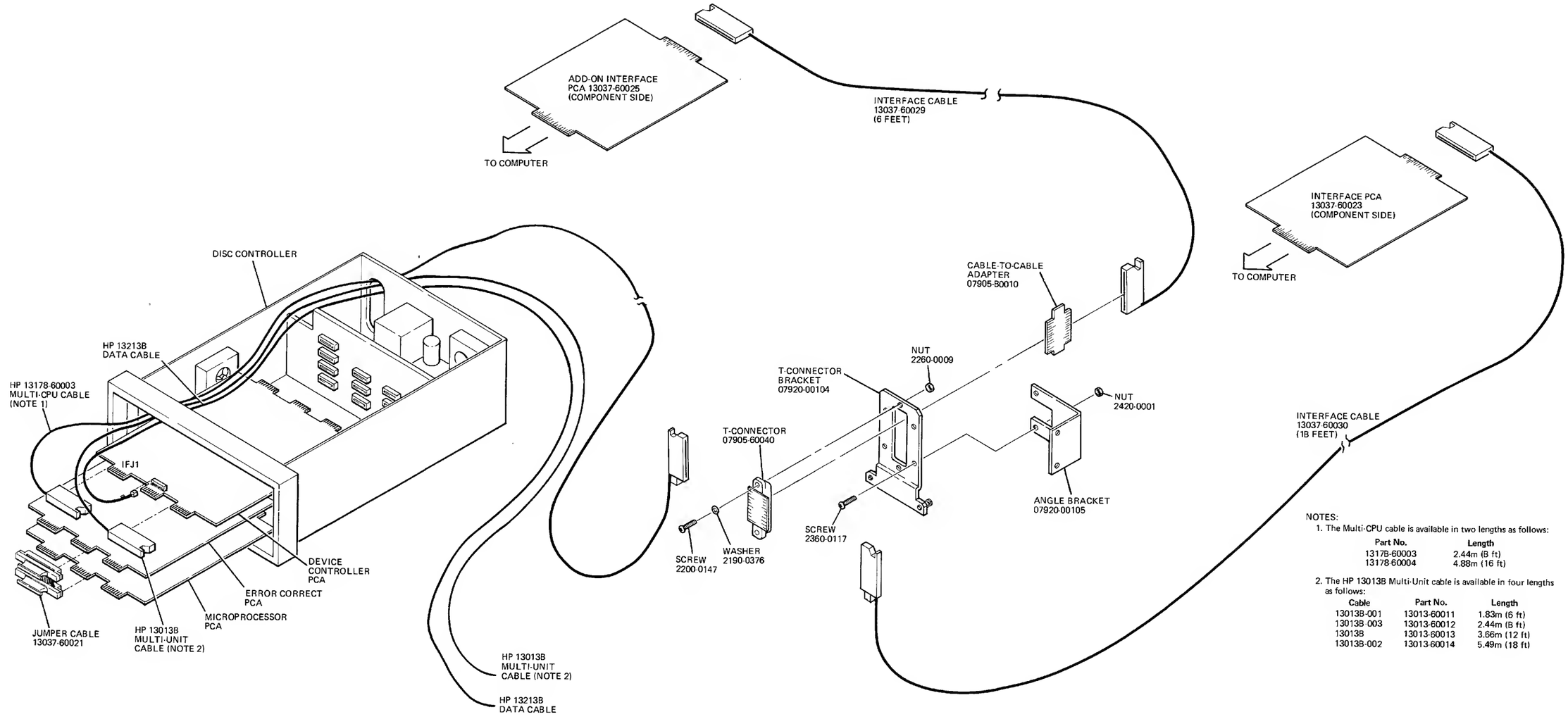






7305-10B

Figure 3-9. D Model Three to Eight CPU Configuration Cabling Diagram



NOTES:

1. The Multi-CPU cable is available in two lengths as follows:

Part No.	Length
13178-60003	2.44m (8 ft)
13178-60004	4.88m (16 ft)

2. The HP 13013B Multi-Unit cable is available in four lengths as follows:

Cable	Part No.	Length
13013B-001	13013-60011	1.83m (6 ft)
13013B-003	13013-60012	2.44m (8 ft)
13013B	13013-60013	3.66m (12 ft)
13013B-002	13013-60014	5.49m (18 ft)

Figure 3-10. HP 13175B/HP 13178C Two CPU Configuration Cabling Diagram

7305-9

NOTES:

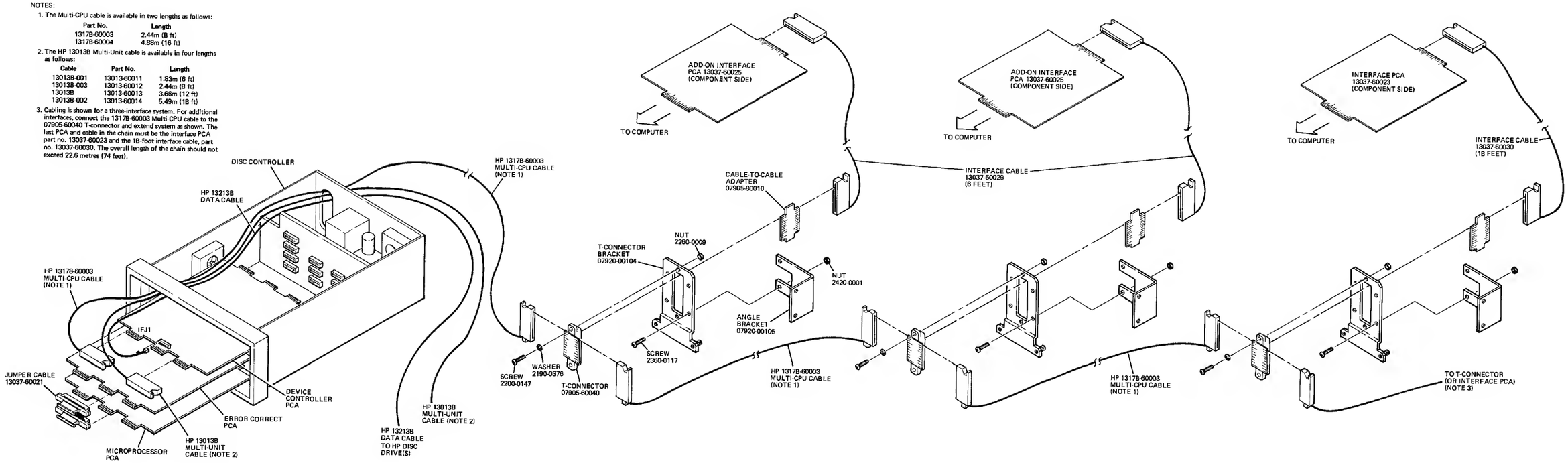
1. The Multi-CPU cable is available in two lengths as follows:

Part No.	Length
1317B-60003	2.44m (8 ft)
1317B-60004	4.88m (16 ft)

2. The HP 13013B Multi-Unit cable is available in four lengths as follows:

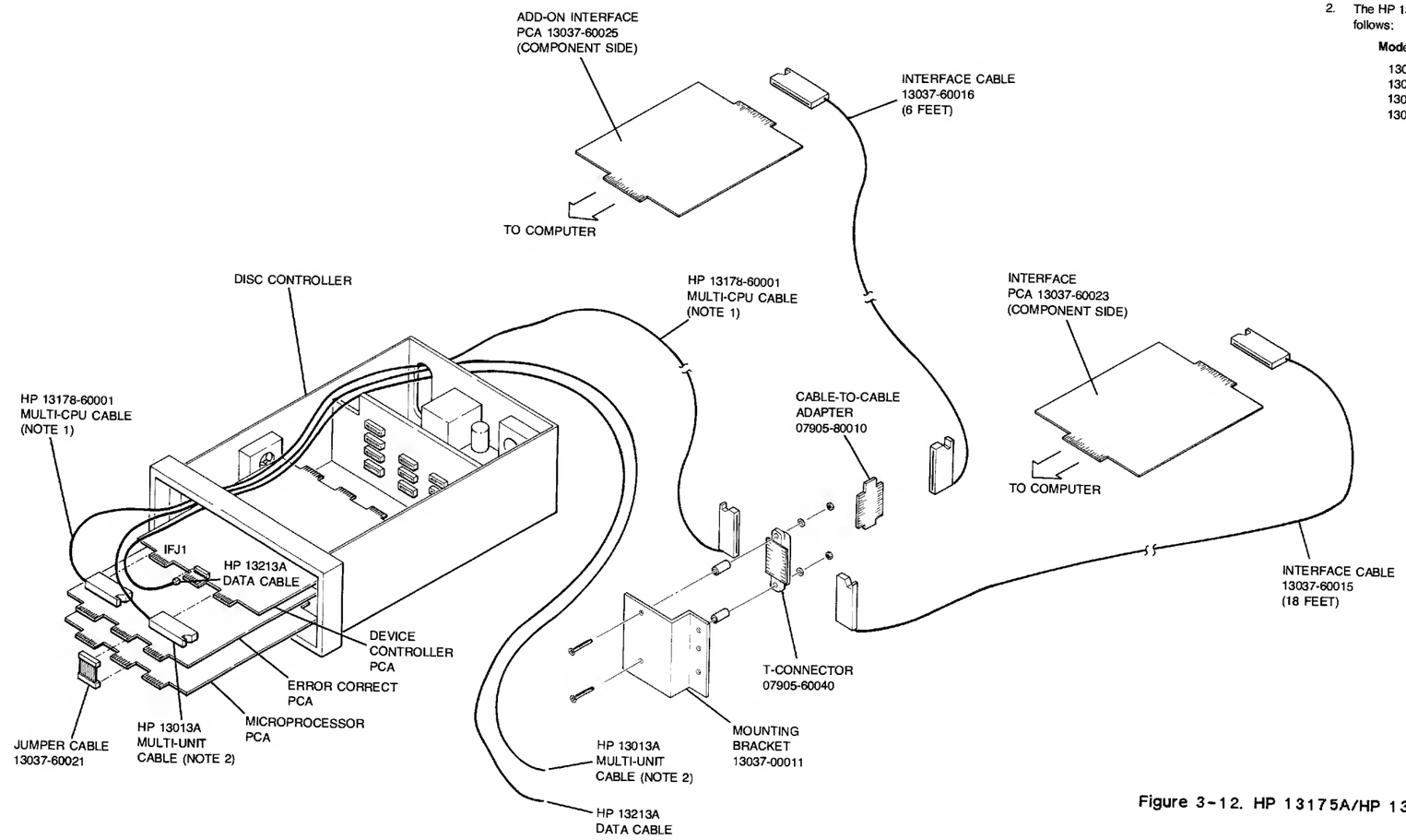
Cable	Part No.	Length
13013B-001	13013-60011	1.83m (6 ft)
13013B-003	13013-60012	2.44m (8 ft)
13013B	13013-60013	3.66m (12 ft)
13013B-002	13013-60014	5.49m (18 ft)

3. Cabling is shown for a three-interface system. For additional interfaces, connect the 1317B-60003 Multi-CPU cable to the 07905-60040 T-connector and extend system as shown. The last PCA and cable in the chain must be the interface PCA part no. 13037-60023 and the 18-foot interface cable, part no. 13037-60030. The overall length of the chain should not exceed 22.6 metres (74 feet).



7305-10

Figure 3-11. HP 13175B/HP 13178C Three to Eight CPU Configuration Cabling Diagram



NOTES:

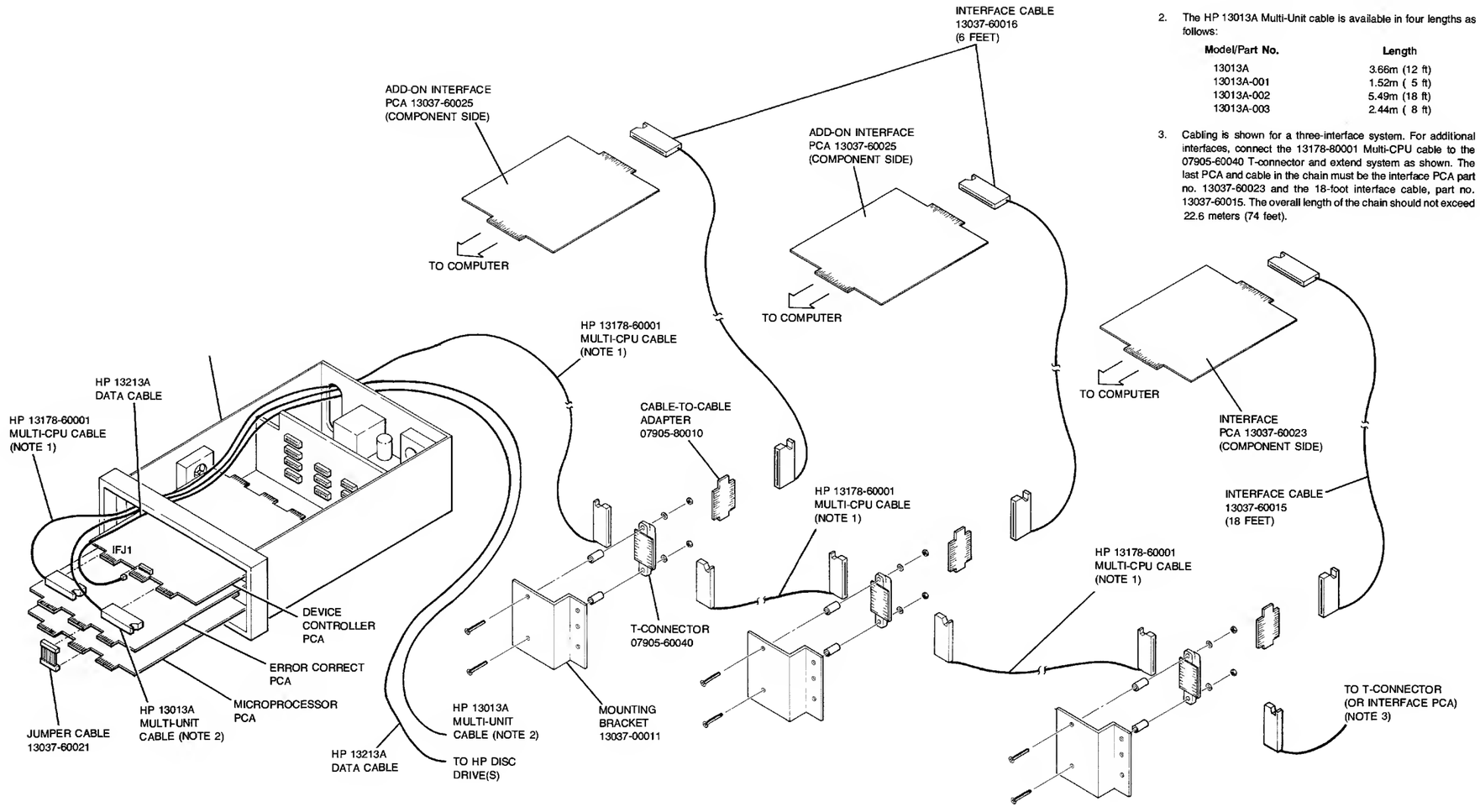
1. The Multi-CPU cable is available in two lengths as follows:

Part No.	Length
13178-60001	2.44m (8 ft)
13178-60002	4.88m (16 ft)

2. The HP 13013A Multi-Unit cable is available in four lengths as follows:

Model/Part No.	Length
13013A	3.66m (12 ft)
13013A-001	1.52m (5 ft)
13013A-002	5.49m (18 ft)
13013A-003	2.44m (8 ft)

Figure 3-12. HP 13175A/HP 13178B Two CPU Configuration Cabling



NOTES:

1. The Multi-CPU cable is available in two lengths as follows:

Part No.	Length
13178-60001	2.44m (8 ft)
13178-60002	4.88m (16 ft)

2. The HP 13013A Multi-Unit cable is available in four lengths as follows:

Model/Part No.	Length
13013A	3.66m (12 ft)
13013A-001	1.52m (5 ft)
13013A-002	5.49m (18 ft)
13013A-003	2.44m (8 ft)

3. Cabling is shown for a three-interface system. For additional interfaces, connect the 13178-80001 Multi-CPU cable to the 07905-60040 T-connector and extend system as shown. The last PCA and cable in the chain must be the interface PCA part no. 13037-60023 and the 18-foot interface cable, part no. 13037-60015. The overall length of the chain should not exceed 22.6 meters (74 feet).

Figure 3-13. HP 13175A/HP 13178B Three to Eight CPU Configuration Cabling Diagram

TROUBLESHOOTING

SECTION IV

4-1. INTRODUCTION

See figure 4-1 for troubleshooting sequence. All section references apply to the appropriate service manual (refer to Related Manuals). Refer to tables 2-4 and 2-5 for voltage values. See figure 2-6 for test points.

4-2. PCA FUNCTIONS

Device Controller PCA

- Communicates with CPU interface and disc drives
- Receives CPU input commands and write data
- Serializes and formats data
- In write mode-encodes data into a 16-bit pattern for CRC field
- In read mode-reencodes data and does CRC check

Microprocessor PCA

- Supervises overall controller operation
- Control operation-no data transfer
- Sense Operation-determines controller state
  - -selects disc drive
  - -identifies errors and unusual conditions
- Read Operation-transfers data from disc to CPU
- Write Operation-transfers data from CPU to disc

ECC/ROM PCA

- Write mode-encodes data into Error Correction Code (ECC) word
- Read mode-reencodes data into ECC word and compares it to original ECC word. Determines if data is correctable or uncorrectable

Power Supply

- Provides -5V, +12V, +5V, -20V

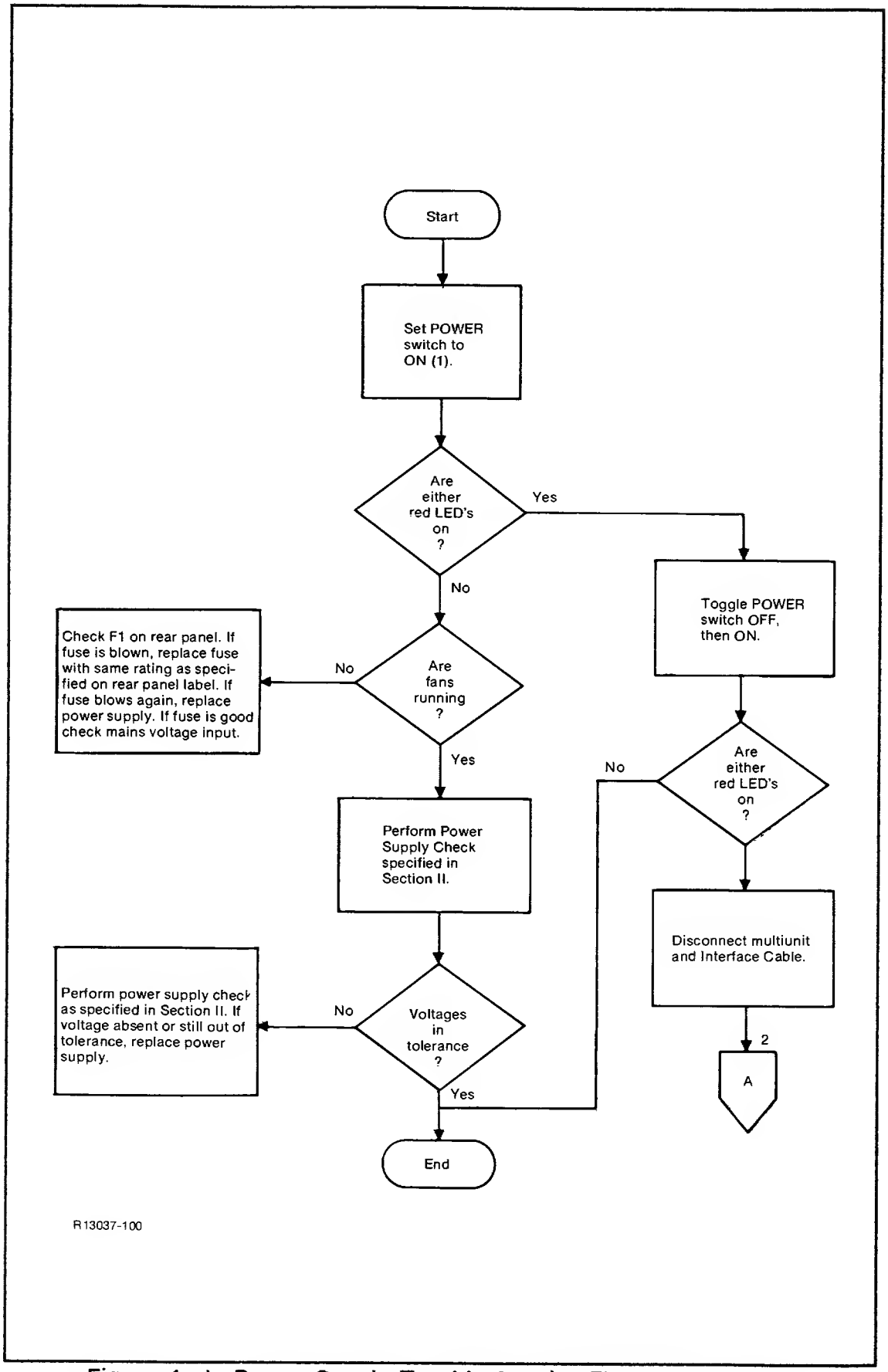


Figure 4-1. Power Supply Troubleshooting Flowchart (1 of 2)

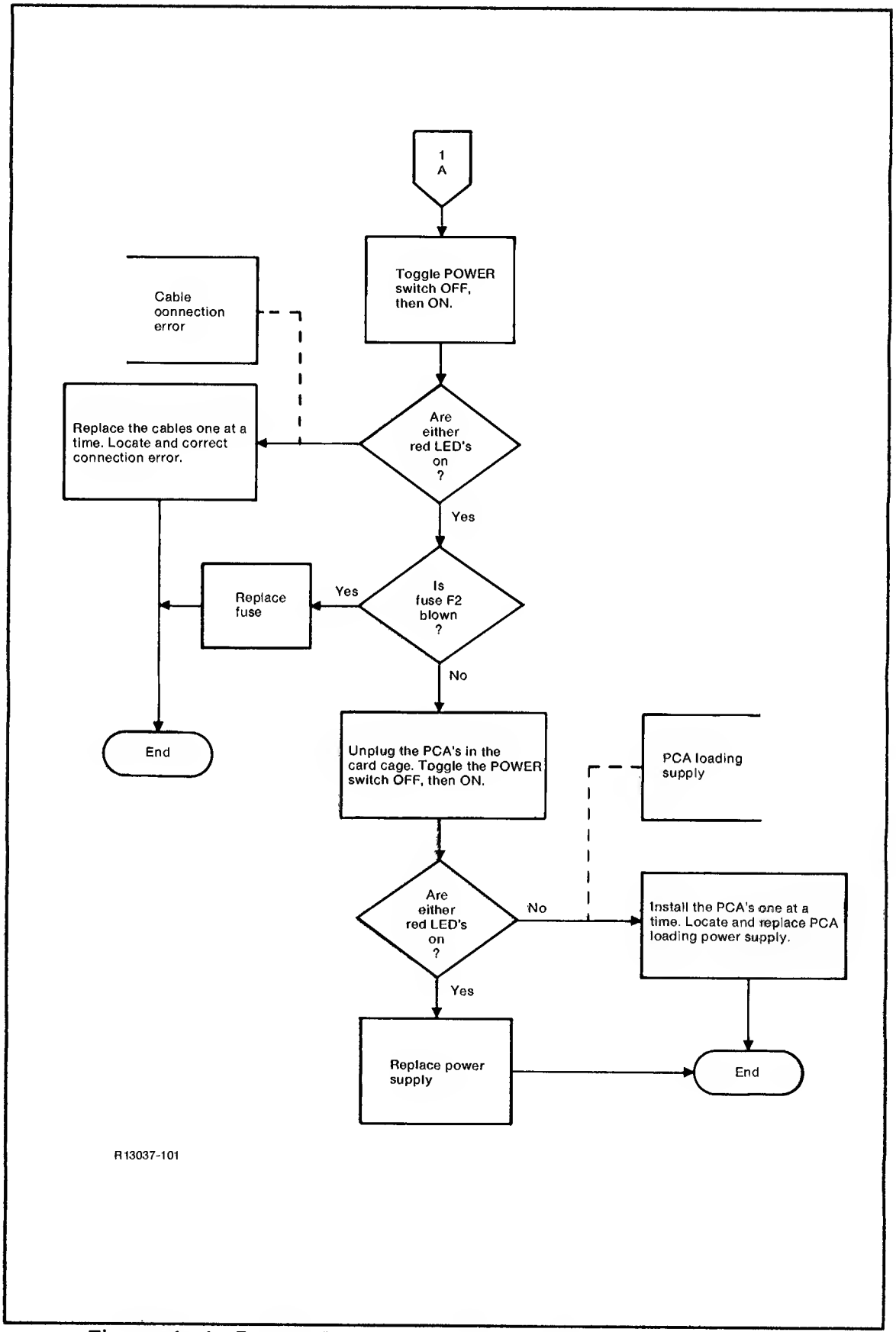


Figure 4-1. Power Supply Troubleshooting Flowchart (2 of 2)

DIAGNOSTICS

SECTION V

5-1. INTRODUCTION

This section provides information on the various system diagnostics. It also provides information on the various bus functions. Tables 5-1 through 5-3 and Figure 5-1 are provided for reference.

Table 5-1. System Diagnostics

HP 1000 M, E, F SERIES

TITLE: HP79XX/13037 Disc Memory Diagnostic
MANUAL P/N: 12962-90001
DIAGNOSTIC MEDIA:

2645 Cartridges	(24396-13306)
7900 Disc	(24396-13001)
7905 Disc	(24396-13101)
7970 B Mag Tape	(24396-13501)
7970 E Mag Tape	(24396-13601)

HP 1000 A, L SERIES

TITLE: HP 1000 ICD/MAC Disc Diagnostic
MANUAL P/N: 5955-4355
DIAGNOSTIC MEDIA:

2645 Cartridge	(24398B #20)
CS/80 Tape-Linus	(24398B #22)
8 in. Floppy	(24398B #41)
5.25 in. Floppy	(24398B #42)
3.5 in. Floppy	(24398B #44)
7970E Mag Tape	(24398B #51)

HP 9835/9845 DESKTOP

TITLE: DISCO, DISKEY
MANUAL P/N: (Integrated with diagnostic - HELP)
DIAGNOSTIC MEDIA: 9845 Tape Cartridge (98041-90010)

HP 3000 SERIES III

TITLE: Disc Verifier (SLEUTH, SLEUTH-07)
MANUAL P/N: (Integrated with diagnostic)
DIAGNOSTIC MEDIA: 7970E Mag Tape (32230-90002)

TITLE: WORKOUT2
MANUAL P/N: 30000-90172 (HP 3000 III CE Handbook)
DIAGNOSTIC MEDIA: (On-line, integrated with op system)

TITLE: Colossus
MANUAL P/N: (Integrated with diagnostic - HELP)
DIAGNOSTIC MEDIA: 7970E Mag Tape (35074A)

HP 250 SERIES

TITLE: Hard Disc Diagnostic
MANUAL P/N: 45000-94000 (CE Handbook)
DIAGNOSTIC MEDIA:

CS/80 Tape-Linus	(45260-19001)
8-in. Floppy	(45260-18001)

Table 5-2. Status Words for MAC Disc Drives

Status Word 1

15	0	Track flagged spare
14	1	Track flagged protect
13	2	Track flagged defective
12	3	Encoded status - - - - - - - -
11	4	Encoded status | Refer to |
10	5	Encoded status | table |
9	6	Encoded status | 5-3 |
8	7	Encoded status - - - - - - - -
7	8	reserved
6	9	reserved
5	10	reserved
4	11	reserved
3	12	Unit number
2	13	Unit number
1	14	Unit number
0	15	Unit number

Status Word 2

15	0	Status word 2 error
14	1	Drive type 000000 = 7906
13	2	Drive type 000001 = 7920
12	3	Drive type 000010 = 7905
		000011 = 7925
11	4	Drive type
10	5	Drive type
9	6	Drive type
8	7	reserved
7	8	Attention required
6	9	Write protected
5	10	Format switch on
4	11	Drive fault
3	12	First status (Heads just loaded over media)
2	13	Seek check Caused by invalid cylinder, head or sector address,
1	14	Drive not ready or multiple seeks requested
0	15	Drive busy

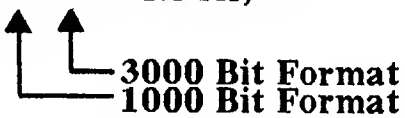


Table 5-3. Request Status Fields

STATUS 1: CONTROLLER STATUS LAST OPERATION

00 NORMAL COMPLETION. Transmitted in one of two situations:

a. When command has been fully executed without error.

b. At completion of a REQUEST STATUS command when it is the first command issued after interface is connected to controller during a polling sequence. In this case, the U field is zero.

01 ILLEGAL OPCODE. A command word has been received by the controller of which bits 12-8 contain a command code which is not one of controller's command set.

02 UNIT AVAILABLE. Controller transmits this status after interface has put out a WAKEUP command for a specific drive and that drive has become available.

07 CYLINDER COMPARE ERROR. During verification of address of sector preceding the address of first sector to be read from or written to, the contents of cylinder address field of that sector do not match contents of controller's cylinder address register. When this status is received, the system should issue a RECALIBRATE command and then retry data transfer sequence. This status is transmitted only after the sequence of events listed below.

a. Addresses do not compare as described above.

b. Controller generates a seek-to-address from its cylinder address register and head-sector address register.

c. Controller again attempts to verify a sector.

d. Addresses still do not compare.

e. The S bit is not set at new track address.

10 UNCORRECTABLE DATA ERROR. This status is generated by the error correction circuits and is transmitted in one of three cases:

a. Immediately following a data transfer (or VERIFY) command if error is uncorrectable.

b. In response to a REQUEST SYNDROME command whenever a Possibly Correctable Data Error has proved uncorrectable.

c. During sector address verification preceding the address of first sector to be read from or written on, the controller cannot read (verify) and of 16 consecutive sectors without error.

11 HEAD-SECTOR COMPARE ERROR. Similar to Cylinder Compare Error, including controller's recovery attempt sequence described for that status, except that in this case the head and/or sector address fields of the disc sector do not compare with corresponding fields in the controller's head-sector address register. The system need not issue a RECALIBRATE command when this status is received.

12 I/O PROGRAM ERROR. The interface of systems containing a programmable data channel separate from the CPU may detect abnormal channel operations and notify the controller. At that time, controller will interrupt the CPU with this status. An example of such an error might be an inconsistent direction of data transfer (a READ command has been transmitted to controller, but channel has been programmed to write).

14 END OF CYLINDER. A multiple-sector data transfer must continue beyond end-of-logical-cylinder, but file mask will not allow controller to automatically seek to next logical cylinder and continue.

16 OVERRUN. Detected by interface (read) or controller (write) whenever the instantaneous data rate of controller exceeds that of the CPU-interface combination. The overrun is reported at end-of-sector in which it occurred. The contents of that sector, either on disc (write) or in I/O buffer (read), should be considered invalid.

Note: The controller always transfers complete sectors. If CPU or data channel wishes to transfer less than a complete sector, it must notify interface (or controller) when transfer is complete so that subsequent controller requests for data transfer do not cause an overrun error.

Table 5-3. Request Status Fields (cont)

17 POSSIBLY CORRECTABLE DATA ERROR. This status is generated by the error correction circuits and is transmitted in one of two cases as follows:

a. Immediately following a data transfer (or VERIFY) command if error is possibly correctable.

b. In response to a REQUEST SYNDROME command if error is in fact correctable. In this case, proceed as described in REQUEST SYNDROME command.

20 ILLEGAL ACCESS TO SPARE TRACK. The same conditions and sequence of events described for a Cylinder Compare error or Head-Sector Compare Error have occurred, except that S bit is set at a new track address. This error usually results from trying to directly access (via a SEEK command) a spare track in active use. The addresses will not compare because of the way in which spare tracks are set up and this status merely differentiates between this situation and other address errors.

21 DEFECTIVE TRACK. Detected during verification of track status of the sector preceding the address of the first sector to be read from or written on. Defective track status is issued when the D bit is found to be set but File Mask will not allow automatic seeking to a spare track. This status is also issued if the D bit is set but the spare track address is the same as the defective track address.

22 ACCESS NOT READY DURING DATA OPERATION. While in the process of transferring data to or from the disc, the track center detector in the drive detected head motion. The transfer should be retried.

23 STATUS 2 ERROR. The controller is unable to complete a command due to some condition in the disc drive. The Status 2 word may be examined for reason. Examples of Status 2 Errors are:

a. An Initialize command, but FORMAT switch is off or PROTECT (READ ONLY) switch is on.

b. A SEEK command is issued to a drive which is Not Ready (heads unloaded).

26 ATTEMPT TO WRITE ON PROTECTED TRACK. Status detected during verification of track status of the sector preceding the first sector to be written on using a Write command. This status information is issued when the P bit is found to be set and the FORMAT switch is off.

27 UNIT UNAVAILABLE. This status is returned whenever the U field of the command word is greater than 7 (octal).

Note: The interface busy bit is false whenever this status is returned.

37 DRIVE ATTENTION. Controller generates an interrupt (issues STINT) to the interface which last accessed the drive which is requesting attention (or to interface 0 if this is the first attention after power-on or hard clear) whenever all of the following occur:

a. Drive is requesting attention.

b. Interface does not have a subsequent command pending in its command buffer excepting WAKEUP, which is ignored here.

c. Interface flag INTOK (Interrupt O.K.) is set, thereby allowing attention interrupts.

Briefly, conditions causing a drive to request attention are the following:

a. Seek completion.

b. Drive becomes ready (heads load).

c. Drive becomes not ready (heads unload).

d. Seek check, illegal cylinder address.

e. Drive Fault.

Refer to the appropriate Disc Drive User's Manual for a more complete description of these conditions.

Table 5-3. Request Status Fields (cont)

STATUS 2: STATUS OF DISC DRIVE ADDRESSED BY STATUS COMMAND

S2 Unit status

Bit	
0*	Drive busy (BS)
1*	Drive not ready (heads not loaded) (NR)
2*	Seek check (SC)
3	First status (FS)
4*	Fault (FLT)
5	Format (FRM)
6	Upper/Lower Protect or Read Only (RO)
7	Attention (ATN)
8	(Reserved)
9-12	Encoded drive type (used by controller to determine last available head and sector) (DRV TYP)
15	Status 2 error (true if any bit marked * is true) (ER)

Table 5-4. Tag Bus Functions Summary

TAG BUS		CONTROL BUS (Refer to Table 4-4)	
OCTAL CODE	OPERATION		
00	READ*	STATUS	INFORMATION FROM THE DISC DRIVE
01	WRITE*	STATUS	
02	REQUEST STATUS*	STATUS	
03	REQUEST ATTENTION	ATTENTION	
04	DISCONNECT		
05	CLEAR		
06	REQUEST SECTOR*	HEAD-SECTOR ADDRESS	
07			
10	SEEK*	CYLINDER ADDRESS	INFORMATION FROM THE CONTROLLER
11	ADDRESS RECORD*	HEAD-SECTOR ADDRESS	
12	ADDRESS UNIT	UNIT ADDRESS	
13	RECALIBRATE*		
14	TRANSMIT SECTOR*	SECTOR ADDRESS	
15	OFFSET*	OFFSET	
16	CLEAR STATUS*	SELECT CLEAR	
17			

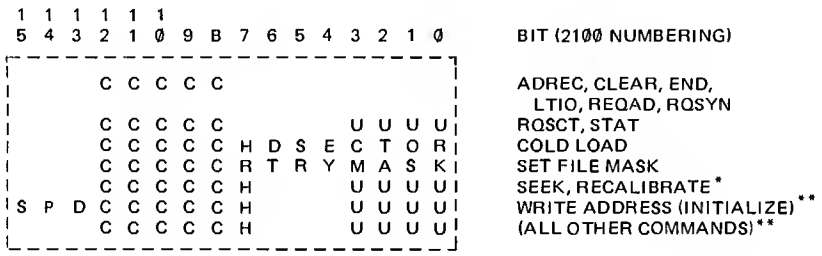
*Only selected units will respond.
Teg bus 3 determines whether controller or disc drive will place information on control bus.
Units respond to commends only after being selected except for Address Unit, Request Attention, Disconnect, and Clear.

Table 5-5. Control Bus Functions Summary

BUS LINE	CLEAR STATUS	OFFSET	CYLINDER	HEAD – SECTOR	UNIT	STATUS	ATTENTION (UNIT)
0	Attention	1	1	Sector 1	1	Drive Busy	0
1	First Status	2	2	2	2	Drive Ready	1
2		4	4	4	4	Seek Check	2
3		8	8	8		First Status	3
4		16	16	16		Drive Fault	4
5		32	32	32		Format	5
6		64	64			Protected	6
7		Sign	128			Attention	7
8			256	Head 1		Sector Compare	
9			512	2		Drive Type 1	
10				4		Drive Type 2	
11				8		Drive Type 4	
12						Drive Type 8	
13							
14							
15							

Each disc drive has a "hold" bit associated with it to prevent two or more CPU interfaces from accessing the same disc drive at the same time. Each command to the controller that references a disc drive (except REQUEST STATUS and REQUEST SECTOR ADDRESS) includes a one-bit hold field which is retained by the controller. While a hold bit is set for a particular disc drive, no other CPU interface may access it with a command that could modify the disc drive status. An attempt to access a held disc drive will cause the controller to leave the command pending on the interface until the desired drive becomes available.

COMMAND FORMATS



WHERE C = FIVE-BIT COMMAND OPCODE:

AS SHOWN	OCTAL	DESCRIPTION
0	0	COLD LOAD READ (BOOT)
400	1	RECALIBRATE
1000	2	SEEK
1400	3	REQUEST STATUS
2000	4	REQUEST SECTOR ADDRESS
2400	5	READ
3000	6	READ FULL SECTOR
3400	7	VERIFY
4000	10	WRITE
4400	11	WRITE FULL SECTOR
5000	12	CLEAR
5400	13	WRITE ADDRESS (INITIALIZE)
6000	14	ADDRESS RECORD
6400	15	REQUEST SYNDROME
7000	16	READ WITH OFFSET
7400	17	SET FILE MASK
10000	20	(NOT AVAILABLE IN 13037 INSTRUCTION SET).
10400	21	(NOT AVAILABLE IN 13037 INSTRUCTION SET)
11000	22	READ WITHOUT VERIFY
11400	23	LOAD TIO REGISTER (3000 SYSTEM)
12000	24	REQUEST DISC ADDRESS
12400	25	END (RETURNS CONTROLLER TO POLL LOOP)
13000	26	WAKEUP

S = FLAG AS SPARE TRACK.
P = FLAG AS PROTECTED TRACK (SUBSEQUENT WRITE COMMAND MAY FAIL).
D = FLAG AS DEFECTIVE TRACK.
HD = HEAD ADDRESS FOR COLD LOAD READ COMMAND.
H = HOLD BIT OF DRIVE
RTRY = DATA TRANSFER RETRY COUNTER (3000 ENVIRONMENTS).
MASK = FILE MASK BITS (SEE DESCRIPTION IN SFMSK PROCESSOR).
U = DISC DRIVE (UNIT) ADDRESSED BY THE COMMAND. ERRORS MAY OCCUR IF U = 10 (OCTAL).
BIT 7 = HOLD BIT. IF SET, RESERVES DRIVE "U" FOR INTERFACE ISSUING THE COMMAND. COMMANDS FROM OTHER INTERFACES TRYING TO ACCESS THIS DRIVE WILL BE DEFERRED UNTIL THE DRIVE IS AVAILABLE.

*HOLD BIT (BIT 7) USUALLY SET TO 1
**HOLD BIT (BIT 7) USUALLY SET TO 0

Figure 5-1. Command Formats

ADJUSTMENTS

SECTION VI

6-1. POWER SUPPLY ADJUSTMENT

Adjust the +5V potentiometer (see figure 2-6) for the values given in tables 2-4 and 2-5.

PERIPHERALS

SECTION VII

7-1. INTRODUCTION

This section will contain host (as opposed to peripheral) information as it becomes available. --Contributions Welcome--

REPLACEABLE PARTS

SECTION VIII

8-1. COMMON REPLACEABLE PARTS

Fuses
Refer to table 2-3.

Fan
3160-0341

Switches
Power 3101-2377

8-2. RECOMMENDED FIELD SPARES

Refer to table 8-1.

Table 8-1. Recommended Field Spares

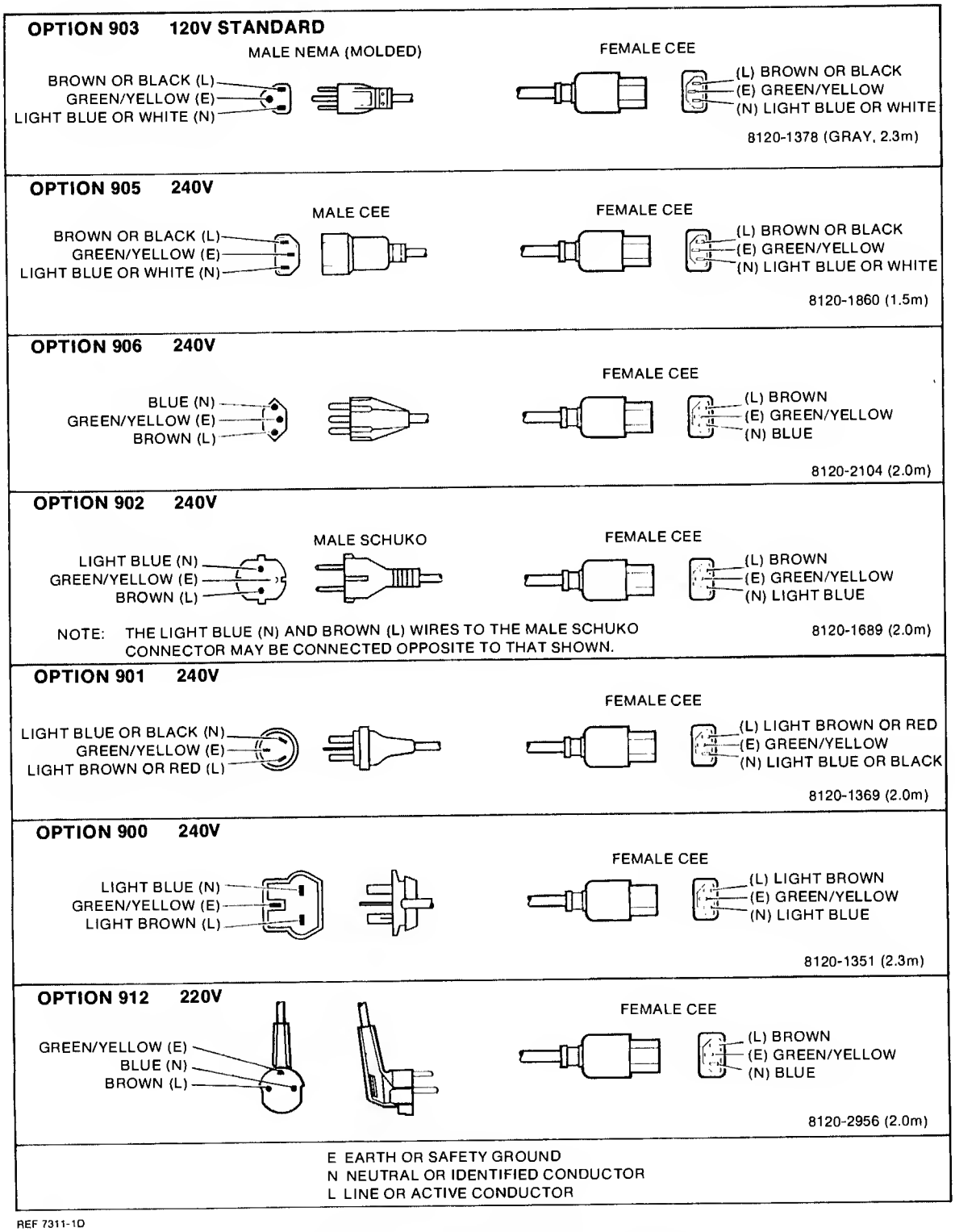
DESCRIPTION	PART NO.	QTY
Microprocessor PCA	13037-6X001	1
Ribbon Connector	13037-60021	1
Interconnect Cable	13037-60022	1
ECC/ROM PCA	13037-6X024	1
Power Regulator Assembly	13037-6X026	1
Power Interconnect Board	13037-60027	1
Device Controller PCA	13037-6X028	1
HP 13037 I & S Manual	13037-90006	1
HP 13037D I & S Manual	13037-90911	1
4 Amp Fuse	2110-0055	2
25 Amp Fuse	2110-0250	2
21XX Interface Support Spares		
Terminated 21XX Interface	13037-6X023	1
Unterminated 21XX Interface	13037-6X025	1
HP 13175/13178 Manual	13037-90015	1
HP 13175D/13178D Manual	13037-90921	1
HP-IB Support Spares		
Ribbon Connector	12745-60004	1
HP-IB Interconnect Cable	12745-50002	1
12745 Interface PCA	12745-60004	1
HP 12745A I & S Manual	12745-90901	1
HP 12745D I & S Manual	12745-90911	1

DIAGRAMS

SECTION IX

9-1. INTRODUCTION

Figure 9-1 through 9-4 are provided for reference.



REF 7311-1D

Figure 9-1. AC Power Cord Sets

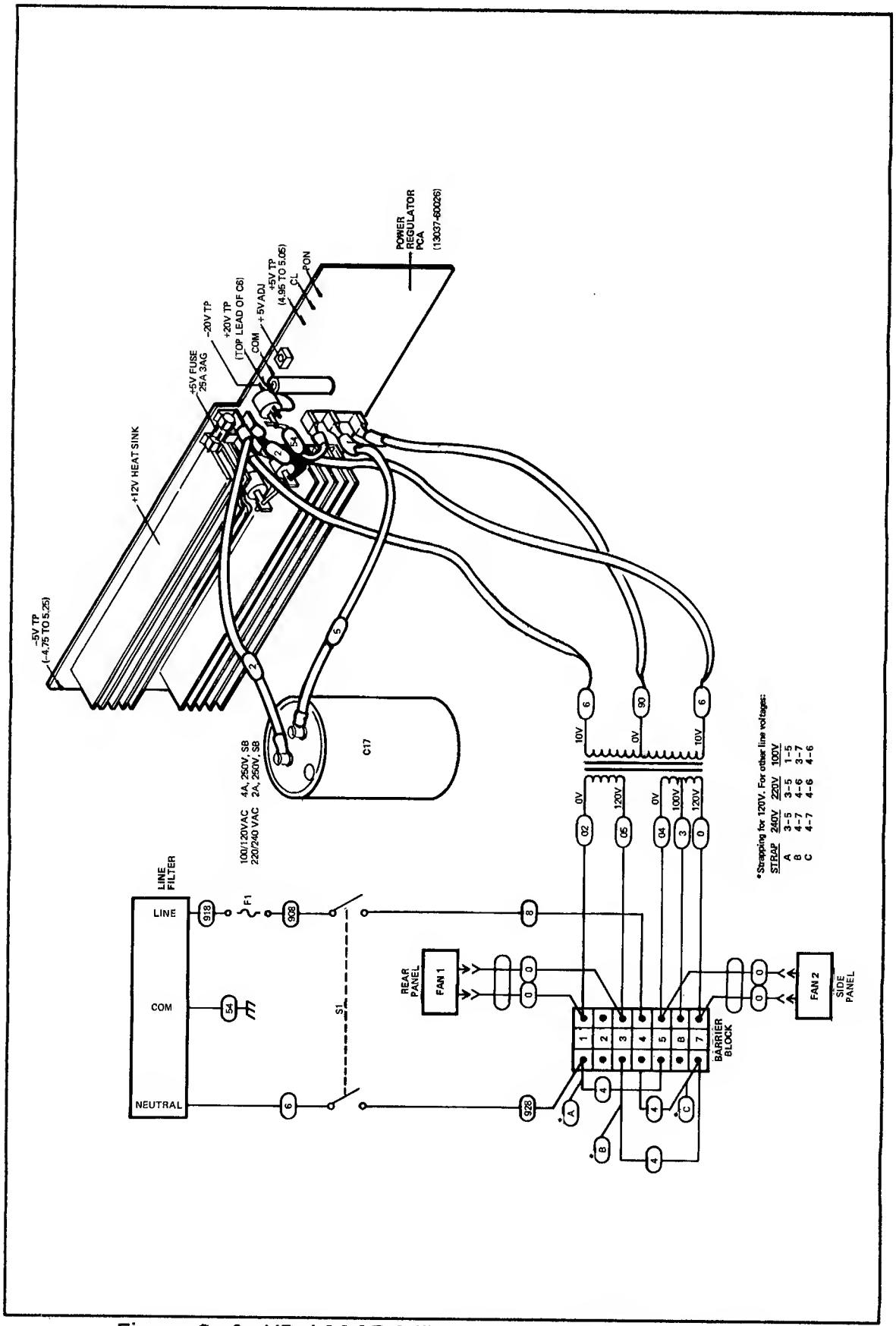


Figure 9-2. HP 13037 C/D Controller Power Distribution

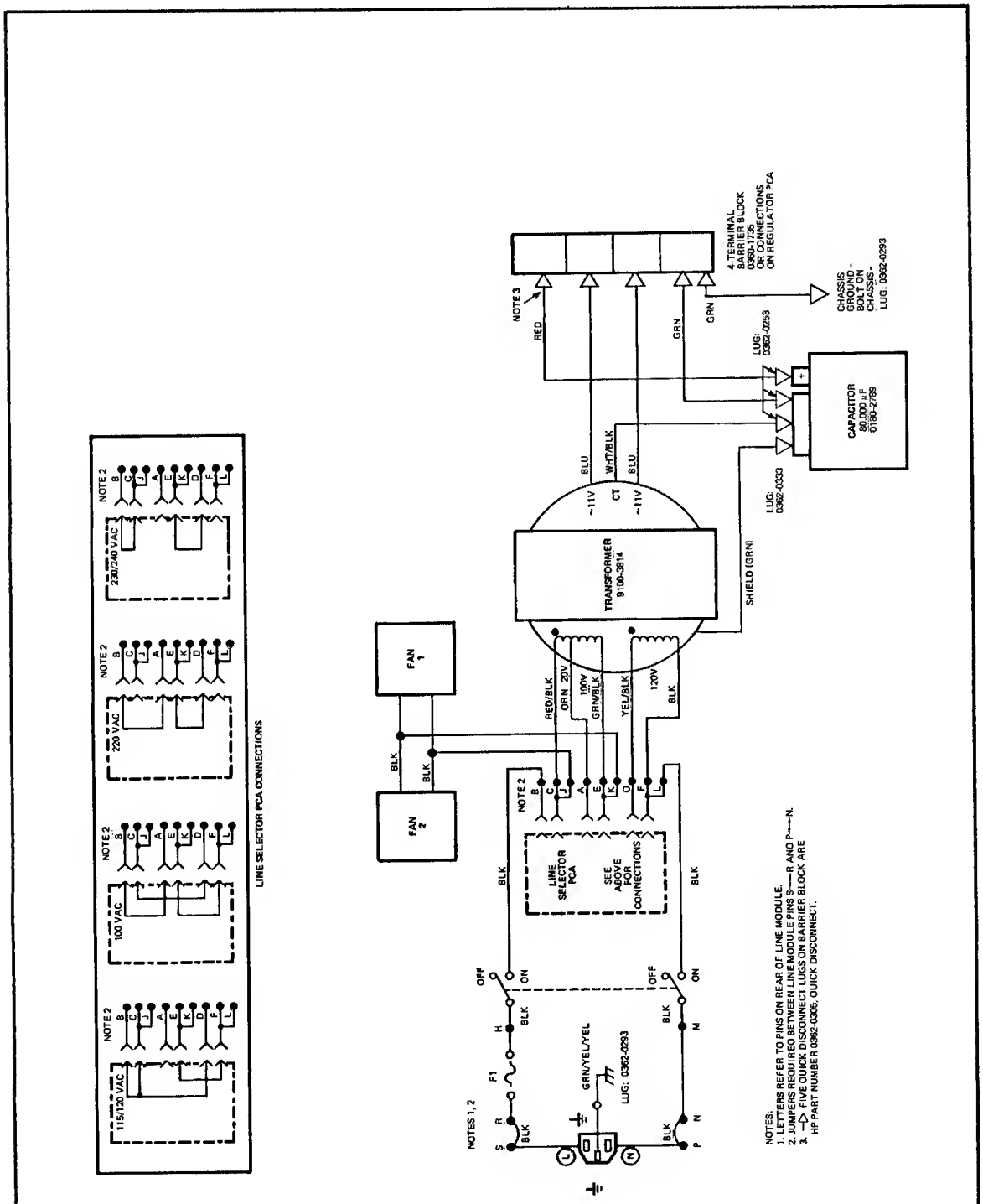
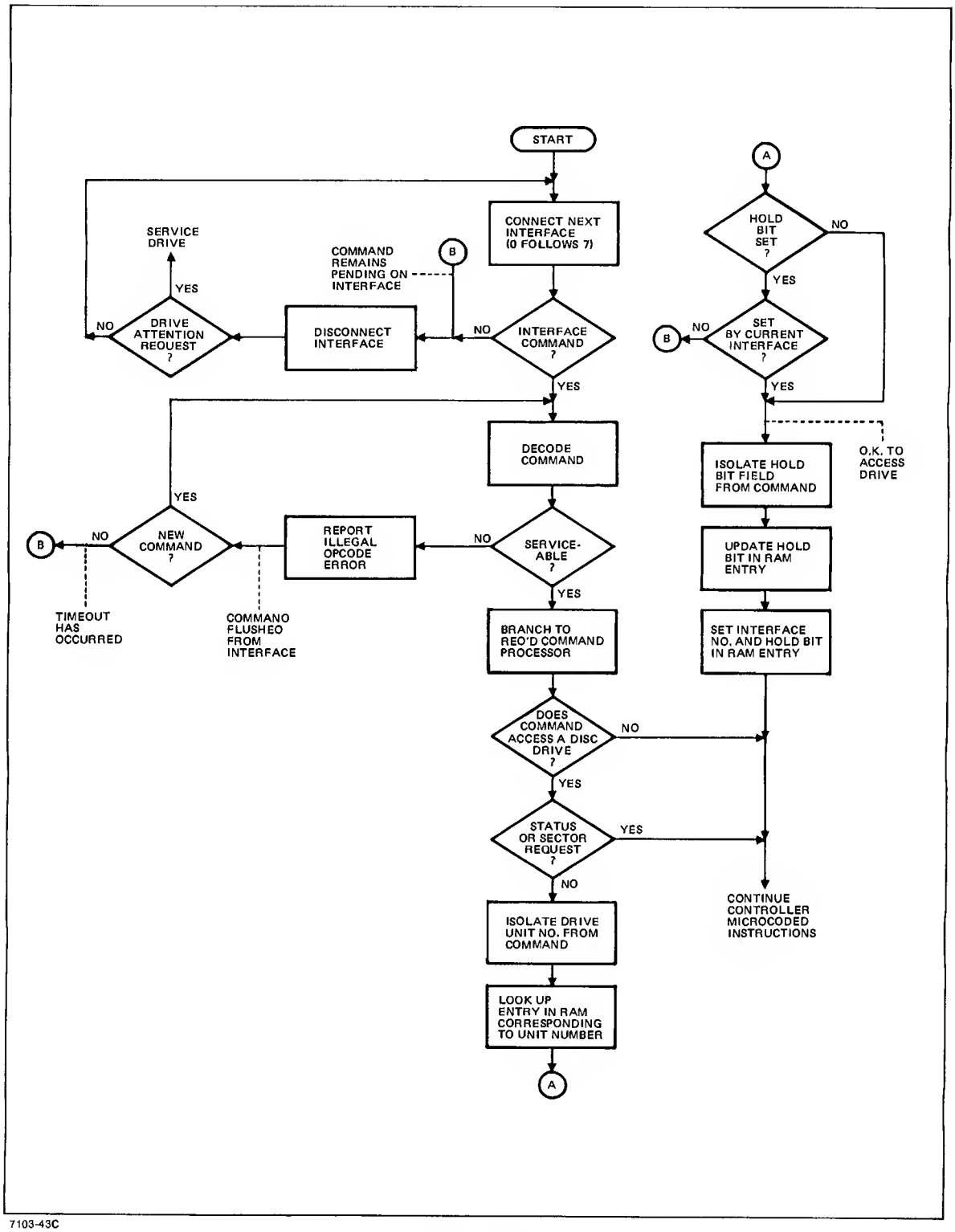


Figure 9-3. HP 13037 A/B Controller Power Distribution



7103-43C

Figure 9-4. CPU Interface Port Polling Flowchart

REFERENCE

SECTION X

10-1. BUS FUNCTIONS

The various bus function summary are given in tables 5-4 and 5-5.

SERVICE NOTES

SECTION XI

11-1. INTRODUCTION

Table 11-1 gives the service note summary for the HP 13037. Table 11-2 gives the service note summary for the HP 12745. There are no service notes on the HP 13175/13178. Table 11-3 is a summary of all released ISOM's on the HP 13037 and HP 12745.

Table 11-1. HP 13037 Service Note Summary

DATE	DESCRIPTION	SERVICE NOTE NUMBERS		
		MODEL A	MODEL B	MODEL C
12'75	2001 INTERFACE ASSEMBLY	1		
5'76	13037-69003 INTERFACE PCA	02A		
7'76	13037-61003 INTERFACE PCA	02B		
4'76	INTERFACE PCA INCOMPATIBILITY	03		
5'76	INTERFACE PCA	03A		
1'79	END OF SUPPORT SERVICE NOTE 13037A-04	04A		
7'77	HP MODEL 13037 A/B DISC CONTROLLER	05		
9'77	13037 POWER REGULATOR ASSEMBLY AND INTERCONNECT BOARD UPDATE	06		
2'78	13037B FILTER ENHANCEMENT		06A	
3'78	POWER SUBSECTION REPAIRS	06B	01	
6'78	13037/7925 UPGRADE SERVICE	07	02	
2'79	13037 POWER TRANSFORMER REPLACEMENT	08	03	01
6'79	DISC SUBSYSTEM RADIATED EMISSIONS			03
5'80	OVERHEATING INTERCONNECT WIRE	09	04	04
4'80	CHANGE IN 13037 CONTROLLER FANS			05A
4'80	CLARIFICATION OF +5V TOLERENCE IN 13037 CONTROLLER	11	06	06
10'81	FAN UPDATE ON DISC CONTROLLER WITH SLEEVE BEARING FANS	11	07	07
8'83	13037 BACK PLANE CONNECTION CHANGE	12	07	07
12'81	13037-6X026 REGULATOR BOARD REPLACEMENT PROCEDURE			08
10'82	MISLOADED CAPACITOR ON 13037 CONTROLLER POWER REGULATOR PCA			09

NOTE 1: On the occassions when duplicate numbers were erroneously assigned, reference the date and title to differentiate the notes.

Table 11-2. HP 12745 Service Note Summary

DATE	TITLE	SERVICE NOTE NUMBER
2'78	INSTALLATION REQUIREMENTS	01
7'78	CLEAR FUNCTION	02
11'78	ERRONEOUS 12745 IDENTIFY SEQUENCE RESPONSE	03 03

Table 11-3. HP 13037/HP 12745 IOSM

Number	Description
13037A-0577-01	Minimum Acceptable Date Codes for 13175A/13178B Controller Interface Kit
13037A-0577-02	Revised Minimum Acceptable Date Codes for 13037 Controller
13037A/B-0877-03	Incompatibility between DCPC and 13037 Interface
13037A/B-0478-01	Suggested 13037 Date Codes
13037A/B-0778-01	Recommended Spares for 13037A/B Controller
13037A/B-0878-01	13037A/B Firmware Changes
13017A/B-0479-01	New VDE/FTZ Double Shielded Disc Subsystem Cables
13037C-0679-01	13037C Disc Controller Product Support Plan
13037D-0689-01	Product Support Plan - 13037U Option 050 HPIB Extender
12745A-0208-01	12745 HPIB Kit for the 13037 Disc Controller Product Support Plan
12745A-0878-01	Occasional 12745A Overruns
12745-0878	Update to 12745A Product Support Plan
12745A-0779-01	12745 HPIB Cable